Appendix E-1

Level of Project/Individual Planning Level

Procedure to Compile Program Plan for Design-to-Cost
(Unit Production Cost and Development Cost)

Table of Contents

(Styles)

1 Paper

The size of paper to be used for the program plan should be A-series, basically A4.

2 Compilation

The program plan should be compiled in the following order:

(1) Cover

(2) Contents

(3) Text

(Example)

Examples are shown beginning on the next page.

(Example)

Document No.	

Development of AAAA

Program plan for Design-to-Cost

Date / / Original
Date / / Revised

Approved by	Checked by	Created by

BBBB Co. Ltd.

Table of Contents

1. Purpose

This document specifies the development management plan based on Design-to-Cost (hereafter referred to as "DTC") implemented to achieve a target unit production cost * and a target development cost* in developing AAAA.

*If the type of target cost is set in this manner.

2. Related Documents

(1) Design-to-Cost Implementation Regulation (AA-001)

(2) Design-to-Cost Implementation Standard (DTCN/DTC-STD-1)

3. Basic Policy

(1) DTC should be implemented with the aim of setting a target unit production cost and a target development cost (hereafter referred to as "target cost") and achieving them. This aim is shared by our company and the contractors.

(2) The organization for activity will include the company's internal organization, and the organization of the contractors and sub-contractors. Our company will take charge of the activity and lead the contractors.

(3) Our company will make an effort in upgrading the quality of activity by spreading knowledge, and educating and enlightening people about DTC.

(4) As to DTC activity to achieve target cost, such activity is promoted during the development period based on Design-to-Cost Implementation Standard. At the same time multiple plans that concern function, performance, schedule and target cost, as well as the reliability and maintainability of the equipment, which affect operation costs, must be taken into consideration as objects of trade-off so that the optimum plan for fulfilling the required performance is selected when specifications on system, sub-system, component, material etc. and development test plan have been set.

(5) In achieving the target unit production cost, the processing man-hour costs, which are expected to take up the largest part of unit production costs, and the direct material costs are designated the main objective items for control. Emphasis is placed particularly on controlling the number of direct material costs for main structural parts and main functional components in order to improve the effectiveness of the activity.

(6) The DTC activity for the development cost must be clarified both for WBS of the whole development process and in each development phase to ensure the effective allocation and utilization of resources. Also plans that enable the effective implementation of design work, prototype production, development testing, and prototype production etc. should be compiled and the budget allocation in

each development phase/contract and the total results (meaning of contract price is in the development phase) should corresponded to each other for the purpose of control.
As for budget allocation, target figures should be set for dividing the work and contents of each development phase of the WBS, taking priorities, expected results and the results of comparative plan studies into consideration. Then the target costs and their appropriate allocations are set, contracts are signed in each phase, and the budget is implemented.
In assessing the prospects for achieving the target cost of unsigned contracts, the results of predicted prospect studies should be reflected in future planning and revision of the budget allocation.

(7) If necessary, individual DTC implementation plan documents should be compiled based on the main purpose of this book.

(8) In order to promote the above-mentioned issues in detail, contractors should separately draw up implementation plan documents for DTC activity on unit production cost and development cost.

(9) The hierarchy of the DTC planning documents related to the concerned development is shown in Table _____.

4. Implementation Organization

DTC activity is a wide-ranging comprehensive activity. Inside a company, as well as among contractors and their sub-contractors, the manufacturers in charge of equipment development, etc., are organically drawn together in each development phase. These people should establish an organization that ensures the smooth promotion of related operations.

4.1 Internal Company Organization

The "Cost Control Section" is designated at development headquarters of AAAA Company BBBBX throughout the development period. It adjusts all of the cost control activities under the instructions of the integration officer of the development department of AAAA group.

A cost branch meeting is set up at a "Liaison meeting with contractors involved in the development of AAAA" to work as a coordinating body for discussions and adjustment between our company and the contractors.

Coordination of discussions and adjustment over cost is done at a "department meeting" of the body for coordinating discussions on matters related to design.

4.2 Organization among Contractors

In order to promote the smooth operation of DTC activity throughout the development period for each contractor, an organization should be set up and someone assigned responsibilities to coordinate activities.

5. Target Cost

5.1 Target Cost

Target unit production cost of product AAAA is set at _____ Thousand yen. Target development cost of AAAA should be _____Thousand yen.

5.2 Conditions to Establish Target Cost

(1) The required specifications, development test requirements and plan concerning development are established as in document _____.

(2) The scope of establishing the target unit production cost should be within the WBS shown in Table _____. The scope of establishing target development test cost should be within the WBS shown in Table_____.

(3) The rate of applied expenses should be the rate of approved expenses and man hour rate of fiscal 199x .

(4) The target unit production cost should be an average unit price on the premises in (7) bellow.

(5) The target unit production cost should be set in fiscal 199x.

(6) The target unit production cost should include expected price increases and the rate of price change between each fiscal year is set as _____% per year.

(7) The number of units produced, which is a precondition of target cost, should be set as XXX and YY per year.

(8) Respective shares of development and production should be prescribed on attached sheetNo. A.

6. Establishment of Individual Target Costs

(1) Within the range of the approved target unit production cost and target development cost, individual target costs for each contractor are established.

(2) As for development cost, dates are designated 4 times a year after considering the existing development results, the approved budget, and the business plan for the year, etc., in order to re-examine the allocation of each target cost.

7. Implementation Plan Document of Design-to-Cost Activity

(1) Contractors should draw up an implementation plan document for DTC activity, which gives a detailed procedure and each target cost to be achieved by implementing the DTC activity. Contractors should conduct activity based on our company's approval. The procedure for drawing up a DTC activity implementation plan document is to follow the Design-to-Cost implementation standard in Appendix E-2 (for unit production cost) and Appendix E-3 (for development cost).

(2) When combining the implementation plans document of DTC activity for unit production cost and for development cost into one, the plan must be able to clarify their relations to each other and describe their mutual association. (Separate documents are recommended.)

8. The Verification Cost Status

(1) Contractors should draw up and submit a verification procedure for present cost status by referring to Appendix E-4 and E-5 Verification Procedure document for the Design-to-Cost Implementation Standard.

(2) Contractors should submit a Design-to-Cost phased result report on the designated date (details should be set separately by each contract and Design-to-Cost implementation plan document) so that our company can verify and evaluate the cost status.

The following items must be included in the Design-to-Cost phased result report:

- DTC cost status report (unit production cost will follow the attached Form 5 of Appendix E-6 and the development plan, attached Form 6A)
- Report on prospects for target achievement (using the attached Form 14 of Appendix E-6)
- Table of measures to achieve target price (unit production cost follows the attached Form 10 of Appendix E-6; development cost, the attached Form 11)
- Progress table of cost status including figures (in Lotus 1-2-3 or Excel)

(3) Contractors should submit or present the following at the request of our company:

- DTC theme/idea proposal sheet (Form 7 or 7A of Appendix E-6)
- DTC worksheet (Form 12 and 12A of Appendix E-6)
- Price/Cost breakdown table (Form 17 of Appendix E-6)

(4) Contractors should verify cost status through the design verification prescribed in the contract specifications (consign contract plan, procurement specifications) and "Request for AAAA Safety and Development Guarantee." Verification documents should be compiled by contractors based on the implementation plan document of DTC activity approved by our company.

9. References

(1) Advanced Project Management Methodology

"Advanced Project management Methodology for Design-to-Customers' Needs and Design-to-Cost" (ASCII Publishing Co.)

Appendix E-2

Procedure to Compile Implementation Plan Document of Design to Unit Production Cost Activities

Table of Contents

1. Style
2. Description method

Description guidelines are marked with " " and description examples are without " ".

(Style)

1. Style

1.1 Paper

The size of paper to be used for implementation plan should be in the A-series, basically A4.

1.2 Compilation

Implementation plan document should be compiled in the following order:

(1) Cover

(2) Contents

(3) Text

2. Description method

To be described referring to examples given on the following page.

(Example)

Document No.	

AAAA

Implementation plan
for
Design to unit production cost activity

Approval Signature

／ ／ Rev. A
／ ／ Rev. 0

Approved by	Checked by	Created by

BBBB Co. Ltd.

Table of Contents

0. Revision record

The followings are the revision records of this document

1. General

1.1 Purpose

In this article, the types of cost targets should be clarified and described as below.

This implementation plan document for Design-to-Cost activity sets the program (procedure and organization) of Design-to-Cost (referred to hereafter as "DTC") activity which is implemented to achieve a target unit production average cost by BBBB Co. Ltd. in designing and developing product AAAA*.

*"The specific name of the product should be given."

1.2 Definition

In this article, terms included in the definition of the Design-to-Cost implementation standard should be used as such and those not included should be defined if necessary.

1.3 Related documents and References

(1) Related Documents

In this article the following documents are designated as the documents to be applied along with others as necessity dictates.

(a) Design-to-Cost implementation standard (DTCN/DTC-STD-1: refer to Appendix E-0)

(b) Verification procedure for unit production (refer to Appendix E-4)

(2) References

In this article the following document as well as others should be referred to as necessity dictates.

(a) Advanced Project Management Methodology:

"The Thinking and Procedure for Design-to-Customers' Needs and Design-to-Cost" (ASCII Pub. Co.)

2. Basic Policy

This article covers the following purpose and contents.

In each step of designing and developing AAAA, the creation and selection from two or more comparative plans should be constantly kept in mind to achieve target unit production cost and considering performance margin backed up with calculations and tests for the object under development.

The through-going method for reducing the unit production cost must be implemented by repeating DTC trade-off work.

Then the following basic policy shall be followed to achieve the unit production target cost and minimize life cycle cost as necessary.

(1) Active promotion of DTC activity to achieve target unit production cost

Achieving the target unit production cost, experience, material and the control method for cost control accumulated through past development and advanced activity by the DTCN/DTC methods should be promoted during the development period. At the same time, to set the system, sub-system, component measures, etc., as well as the specifications and development test plan, DTC trade-off, which includes reliability and maintainability, which affect not only performance and unit production cost but also operation cost, is conducted on multiple comparable plans. In this way, the optimum design plan is set while fulfilling the required performance and enabling the reduction of LCC.

In particular, in the achievement of target unit production costs, processing man-hour costs and direct material costs, which are estimated to take up some amount % of the target unit production cost, are important objective items. As for the processing man-hour costs, emphasis should be placed on controlling the number of fabrication part items and the fabrication and assembly man-hours of the main structural parts* and main functional tests.* As for material costs, it is most important that the main component,* which takes up some amount % of the total, should be controlled to improve efficiency.

*Each must be defined as a concrete item.

3. Product/System WBS

In this article WBS of the objective item included in the target unit production cost should be described faultlessly with the level shown on Form 3 of Appendix E-0.

4. Establishment of each Target Cost

In this article the following items and purposes should be covered.

4.1 Allocated target cost

An average of the target unit production cost is set at _____Thousand yen per unit.

_

4.2 Conditions of Target Costs

4.2.1 Common conditions

(1) The required specifications, development test requirements, and development plan are shown in document No.__ _.
(2) The number of mass- produced machines is __ __.
(3) The exchange rate is _____yen against the dollar.

4.2.2 Conditions for Establishing Target Unit Production Cost

(1) It is an average of unit production cost set on the premise that X units set at the target unit production cost are produced at the pace of Y units annually for the period of Z years.
(2) The target unit production cost is that of fiscal year 199x.
(3) The applied expense rate is the approved expense rate of fiscal year 199x.
(4) The direct material cost is calculated with price or cost as of the end of fiscal year 199x.

5. Organization

"This article prescribes the organization required to conduct the DTC activity."
As to organization, refer to "Framework of DTC organization and management" presented in the attached Form 4. of Appendix E-6

6. Phased DTC Activities using steplist

"In this article we divide the whole itinerary of DTC activity by phased steplist (See attached Form 1 of Appendix E-6) and describe, in a detailed and concrete manner, the procedure to be implemented and the result to be attained in each phase and the relationship of the documents and information required for the purpose, referring to Chapter 8 of this procedure. The format should be exactly the same as the steplist of attached Form 1 or a modified form of it for easier viewing.

7. Establishment of DTC Scheduled Curves

"In this article the following purpose and items should be covered."

7.1 Estimate of Present Status Cost

Follows cost verification procedure of unit production cost.

7.2 Establishment of Scheduled DTC Cost Status Curve

"(a) DTC scheduled curve is established against the whole and the main structure unit of each WBS item that constitutes the target cost in the form of the "DTC Cost Status Report" shown in attached Form 5."
"(b) The period for achieving the target unit production cost should be set before the completion of manufacturing shop operation sheet or the production procedure. Even after the target cost has been achieved, improvements should be made at the site “GENBA” to reduce cost.”

8. Statement of DTC Work at Each Phase

"This article describes the main points of DTC activity in each phase."

8.0 General

"The following operations conducted to collect, compare, trade study and promote measures for cost reduction should be described. A unified format should be used for these operations to demonstrate an understanding of their contents."

(1) To collect themes and ideas that would reduce cost, the attached Form 7 "DTC theme /idea proposal sheet" should be used.

(2) A DTC trade-off should be conducted on the themes and ideas collected in Article (1) in the Creating draft of the configuration structure for schemes.

The forms to be used for the DTC trade-off are the attached Form 12 "DTC worksheet" or Form 12A in Appendix E-6 "DTC worksheet (for software)."

(3) In each development phase, the person in charge of promoting achievement of the target cost should be allocated and assigned to take care of the items for examination and measures. The necessary conditions for their implementation must be organized and satisfied to promote the achievement of the target cost. The attached Form 10 "Theme/Idea promotion table to Achieve Target Cost" should be used.

(4) The current present cost status estimated by reflecting on the results of the above procedure should be included in the DTC cost status report prescribed by Article 7.2.

(5) The measures to fill the gap between the current present cost status estimated and the target cost in Article (4) are described in a predicted report on target cost achievement shown in the attached Form 14. in Appendix E-6

(6) If the concerned person notices of problems, errors in cost and defects in technology in the course of development, the person is obliged to immediately report it to a superior or DTC secretary office so that the appropriate measures can be taken.

Should be described following the samples given hereafter. “Allocation in each phase must follow the eight basic phases in the Steplist which are: first information collection, formulating basic ideas, breakdown structuring, secondary information collection, basics, details, implementation and review. A combination of the contents can be modified by increasing or reducing the number of phases depending on the project background and where the DTC operations are started. However, the position of the secondary information collection must be clarified because it is the important phase where the approach is switched from an inductive to a deductive approach as well as where the decision is made to start full-scale development and irreversible expenses.”

8.1 Phase for First Information Collection/Approving the Unit Production Cost DTC Implementation Plan Document Phase

(1) A DTC implementation plan document (Pre-draft) should be drawn up based on a PMD and beforehand DTC implementation plan document (Pre-draft) and it should be approved by the concerned sections and organizations concerned. This DTC implementation plan document includes items related to the main project other than DTC and is used as implementation plan for the main project.

(2) The necessary information is collected to formulate ideas on products/systems at the phase of basic ideas along with the drawing up of the DTC implementation plan document (draft).

(3) For the above-mentioned matters, a PMD is formulated to get a clear understanding of the basic function of the products/systems when necessary.

8.2 Phase for Formulating Ideas

"Name of this phase should be based on the output name of the phase in which ideas are formulated."

(1) The main cost of the product/system and its characteristics are almost totally decided by the choice of ideas for realizing its basic function. Upon such recognition, several extreme plans and intermediate plans are created in this phase centered mainly on basic function. The plans are then compared and selected on DTC trade worksheet. When selecting a plan, DTC trade study on plans of one to two levels lower should be made, as necessary, to secure a firm basis.

8.3 Phase for Structuring / Organizing Plan

(1) This is the phase for deciding the structure and organizing structure for several factors that are necessary for realizing the basic idea chosen in the previous phase. It is also the phase for clarifying the scope of the target unit production cost of the product and/or system. For the above, object item WBS which presents the whole structure should be compiled and confirmed.

(2) The content/functions of the factors of the above WBS should be clarified.

(3) The target unit production cost is confirmed in this phase "if necessary" and the target cost is allocated in each separate WBS.

8.4 Phase for Secondary Information Collection

(1) According to the outcome of this phase, an assessment and a evaluation and decision are made on whether a full-scale development and its expenditure of funds can be started, taking into account the project structure whose basis is the WBS decided in the previous phase. The WBS is in turn based on the phase for basic design/basic items in which full-scale orders of material and items are launched.

(2) For this purpose, an estimate, in a broad sense (the prospects for achievement of the development cost, necessary technique tests etc.), is made on the total development budget and operation items based on the structure of the WBS which was confirmed in the previous phase. With this, basic consensus and agreement should be obtained from people and parties concerned to move on to the next phase.

(3) In addition to the above procedure, a extraction of the potential theme items upon which the DTC trade has to be made after the following phase must be made.

8.5 Phase for Basic Design/Making of Detailed Plan and Drawing

(1) More than 2-3 plans are created for each DTC theme items collected in the previous phase. Then the plans are compared and the necessary adjustments are made.

(2) Design is conducted with attention paid to cost driving factors. Weight is placed on cost reduction efforts made specifically through the design.

(3) A comparison of the plans for the manufacturing process and jig etc., method to assemble the structures to reduce costs should be drawn into the detailed plan.

(4) The items that should be checked in this phase with regard to concept and structural design are the following:
a. whether it can be smaller
b. if there is room for reduction
c. whether it can be unified
d. whether it is possible to choose material and processing method
e. whether the method, size or number of development tests can be reduced

A checklist is made to examine the above-mentioned items (more than two to three plans should be compared and assessed).

(5) The output in this phase is to compile what items are to be included in each manufacturing drawing of the WBS.

(6) In this phase, orders of material and parts for manufacturing the objective items are started based on the basic design/detailed plan drawing.

8.6 Phase for Detailed Design/Manufacturing Drawing and Plan

(1) The measures for achieving the target cost decided in the previous phase should be put into concrete form.

(2) Make cost reduction efforts placing weight on cost driving factors.

(3) Designers gather together the person in charge of the manufacturing planning and production section etc., review the concerned detailed plan drawing and hold a team meeting* to select ideas to be included in the manufacturing drawing each time a manufacturing plan must be drawn up. The result of the discussions at the meeting should be integrated into manufacturing drawing and jig plans.
*The meeting is called a P Drawing Meeting (P stands for Plan drawing, Pre-review of Production drawing)

(4) Existing methods for the manufacturing plan are reviewed and improvement plans are drawn up and implemented.

8.7 Phase for Development Test and Production

(1) The instruction is given to implement measures which were decided to be adopted in the previous phase to achieve the target cost, and follow-up control is conducted.

(2) When a problem arises during the implementation of (1), a plan is formulated to prevent any increase in unit production cost. The plan is examined and controlled.

8.8 Phase to Review for Mass-Production and Verify Unit Production Cost

Examination and implementation of DTC activity up to the previous phase are confirmed. The unit production cost is calculated excluding the development phase factor by cost verification procedure and achievement of the initial target is confirmed.

9. DTC Activity and cost status report

"In this article, the items to be reported in the DTC activity result report and the report form are described in this article."

The form for the report is shown in Table 1. Reports should be made in each phase shown in the DTC activity steplist at regular intervals. A Design-to-Cost status report is made at the end of contract so that the final report and know-how of the results can be utilized in subsequent development projects.

10. Bar (Gantt) Chart of DTC Schedule

"Referring to the Implementation Plan in the attached Form 18, the contents of a steplist and preliminary operation are compiled in a bar chart.

11. Forms to be used

"The following form is taken from the forms in Appendix E-6 and should be attached."

1. Steplist (Phased Planning Document)..... Form 1
2. Framework of DTC Organization and Management..... Form 4
3. DTC Cost Status Report (for Unit Production)..... Form 5
4. Prospect Report on Target Cost Achievement..... Form 14
5.Table of Measures to Achieve Target Price (for Unit Production).... Form 10
6. DTC themes/ideas proposal sheet (for Unit Production)..... Form 7
7. DTC Worksheet (for hardware)..... Form 12
8. DTC Worksheet (for software)..... Form 12A
9.Price List.....Form 17
10. Table of Implementation Plan..... Form 18
11.WBS Chart..... Form 3

Table 1 Form of DTC activity and Cost Status report

Name of report	What and when to be reported	Application	Form to be used
		Production unit cost	
Cost status report	Each main WBS	○	Form 5
Report on prospects of reaching the target cost	Each main WBS	○	Form 14
The list of measures to reach the target cost	Each main WBS	○	Form 10
Key question sheet	The end of each phase	○	Upper level DTC (Secretary's office will prepare)

Appendix E-3

Procedure to Compile Implementation Plan Document for Design to Development Cost Activities

Table of Contents

1. Style
2. Description method

Description guidelines are marked with " " and description examples are without " ".

1. Style

1.1 Paper

The size of the paper to be used for the implementation plan should be in the A-series, basically A4.

1.2 Compilation

The implementation plan should be drawn up in the following order:

(1) Cover

(2) Contents

(3) Text

2. Description method

To be described referring to examples shown on the following page.

(Example)

Document No.	

Implementation plan
for
AAAA design to development cost activity

Approval signature

／ ／ Rev. A
／ ／ Rev. 0

Approved by	Checked by	Created by

BBBB Co. Ltd.

Table of contents

0. Revision record

The followings are the revision records of this document

1. General

1.1 Purpose

"This article clarifies the type of target cost and describes it as follows."

This Design-to-Cost implementation plan prescribes a plan document for Design-to-Cost (hereafter referred to as "DTC") activity for the development cost implemented to achieve the target development cost when BBBB Co. Ltd. develops AAAA*.

*"The specific name of the product should be given."

1.2 Definition

In this article, the terms defined by an article in Design-to-Cost implementation standard are used as such. Undefined terms should be defined if necessary.

1.4 Related documents and References

(1)Related documents

The following will be designated as related documents in this article and others will be included when necessary.

(a) Design-to-Cost implementation standard (DTCN/DTC-STD-1: refer to Appendix E-0)

(b) Verification procedure document of development cost (refer to Appendix E-5).

(c) "Procedure for Classification of Unanticipated Costs in the Implementation of DTC of Development Cost and the Measures" {refer to Chap. 8.5 of Reference (a) (as a draft)}

(2) References

The following will be designated as a related document in this article and others will be included when necessary.

(a) Advanced Project Management Methodology:

"The Thinking and Procedures for Design-to-Customers' Needs and Design-to-Cost" (ASCII Publishing Co.)

2. Basic Policy

"This article is to cover the following purpose and contents."

(1) In designing and developing AAAA, the creation and selection of comparative plans should be constantly kept in mind to achieve target unit production cost and minimize lifecycle cost for the object

under development. Then multiple plans are created and compared as a thorough going method for reducing the development cost of the chosen plan, actively implementing DTC trade-off.

In order to achieve the target development cost, DTC activity through the creation and comparison of multiple plans on advanced development method is promoted based on experience, documents, and the control test method etc. that have been accumulated from several development projects.

(One example is to conduct DTC trade-off between an "existing method in which the mold for a prototype and the press mold for unit production are made separately" and a "method to create the unit production mold from the beginning and skip the prototype manufacturing by utilizing software, made possible by progress in the know-how of press mold production and modification.")

As to achieving detailed target development cost of the development method selected by the development cost DTC, emphasis is placed on personnel costs (the number of tests, processing, design etc.) which is expected to take up about some amount % of its total and direct material costs (purchase price, outside production costs) for development cost.

That is the number of designs, tests and amount of processing is allocated and placed under special control regarding personnel cost. Regarding the major development purchase item and other purchase item, specifications and price negotiations, mainly, are placed under special control by clarifying the details of their price structure through price/cost breakdown table (Form 17) so that the development cost control activity is improved.

(2) Effective Allocation and Utilization of Target Development Cost and Current Present Cost Status

a. The object of development is clarified through a development objective PMD and object WBS.

b. Then the development activity item (with pictures) for the object item indicated by the WBS above is evolved into a development activity PMD (plan).

c. Initial estimates (initial current present cost) correspond to each item of the development activity plan. By corresponding the total initial target and the target development cost, how much of the development cost should be reduced is clarified.

d. In the progress of the development phase (DTC of formulating ideas, DTC or Configuration DTC of basic plan drawing, DTC of detailed plan drawing, DTC of manufacturing drawing), along with the clarification of the created, compared and selected design plan, the contents of that comparative development measure and test method should be described, compared and selected following "The two-page plan for the estimate of development activity and cost" in order to conduct DTC trade study which is to compare development methods. The structure of the development activity PMD for the whole is also reviewed based on the result.
(Note) Most of the development cost is generated when the actual product is made and tested. Predicted prospects for its achievement are almost totally set by decisions on the design plan of the body and by the phase in which decisions on prototype and test plan are made. Therefore the effective DTC activity of development cost is almost completed by that phase. The DTC results of development cost are allotted to the current present cost of the prototype, the production cost of the test model and the test cost etc. by the time the test sight plan of the development object WBS is decided.

e. As development progresses, a detailed assessment of the DTC trade results as regards the estimate for the means of development_should be conducted. "The two-page plan form for the estimate of development activity and cost" should be used here. The result of the assessment is compared with the initial estimate and is established as the new "partial current present cost" of that part.

- The total of this "partial current present cost" and those arising before this point (including final contract figure before this point) correspond with the initial estimate and target cost, and set as the total current development cost at that point.

3. Development Object WBS and Development Activity PMD/WBS

"This article indicates the scope of the development object items by means of development object WBS, and also the activity that designs and tests the items with an illustrated PMD. By this WBS and PMD, the object of the DTC of target development cost and its scope are shown."

4. Establishment of Individual Target Costs

"This article covers the following items and purpose."

4.1 Individual Target Costs

Target development cost is set at _____ Thousand yen.*

*Figure adjusted with our company is written by document.

4.2 Conditions for Establishing Individual Target Costs

4.2.1 Common conditions

(1) The required specifications, development test requirements and development plan are as shown in Document No._____.

(2) The exchange rate is set at _____ yen/dollar.

4.2.2 Conditions for Establishing Target Development Cost

(1)The target development cost should include the cost increases based on approved expense rate of fiscal year 199x. However, the expected rate of increase for the expense rate should be _____% annually.

(2) The target development cost does not include unanticipated costs. However, target cost will include those on which it is decided to do backup development in order to prevent development risk.

Each time an unexpected incident occurs, multiple comparative plans for the measures required to deal with it are created for the DTC of the unexpected cost. Through DTC trade, budget is allocated from reserve on the result.

5. Organization for DTC Activity

This article shows the organization necessary for conducting DTC activity. (If it must be changed by some development phase, the organization to be changed is shown.) As to organization of activity system, refer to " DTC Organization framework and management" shown in the attached Form 4.

6. Phased Activity for Development Cost of DTC using steplist

This article is to separate the whole schedule of development cost DTC activity into phases and describe in detail the operations to be implemented and the results to be obtained in each phase as well as the relations of necessary documents, information etc., referring to Chapter 8 for this procedure. The form to be used to appropriately and concisely describe the division of the development phase and

operations at each phase is the steplist in the attached Form 1. Phase divisions can exceed eight if needed.

7. Establishment of DTC scheduled curve

This article is to cover the following purpose and items.

7.1 Estimate of target cost and current present cost

Follow the approved verification procedure document of development cost.

7.2 Establishment of scheduled DTC cost status curve

This article is to cover the following matter and related matters.

a. DTC target cost is allocated against the whole target development cost at the vertical line of the "Development DTC Cost Status Report" form shown in the attached Form 6. This current present cost should be reviewed at the end of each phase and the review result reported in Form 6A.

b. The period for the achievement of each target development cost allocated by the phased development contract should be set before the signing of the contract concerning the prototype and the manufacturing development test of the prototype.

c. The contract is signed based on Form 15 "Two-page plan for the estimate of development activity and cost."

8. Statement of DTC work at each phase

This article describes the general statements and detailed statements of each phase of DTC activity which was shown in the steplist in Section 6.

8.0 General

The policy on the following operations for collection, comparative study, and the promotion of measures for cost reduction should be described. For these operations, unified forms should be used to grasp and understand their contents. The forms will be presented.

a. For those cases in which it is not clear what has to be done, a PMD (purpose and measure diagram) must be made to clarify a rough procedure on where to start and what to do. (The PMD method is shown in reference (2) (a).)

b. Using PMD, etc., as a step, themes/ideas on the development method that would clarify specifications and reduce costs as much as possible will be collected by the people concerned.Form 7A "DTC theme/idea proposal sheet (for development cost)" will be used to describe the collected themes/ideas.

c. As for the theme/idea proposal sheets collected above (a), the DTC secretary, etc., will allocate a phase/period of implementation of DTC trade study of development cost or implementation. When the period comes, the possibility of a DTC study is examined and the development DTC trade-off operation, which is used to create, compare, study and select DTC comparative plans, is conducted. The DTC trade-off form is to follow Form 12 and 12A "DTC worksheet."

d. A person in charge of promotion is assigned to each item in each development phase before the start of each phase to achieve the target cost for subsequent phases. The conditions necessary for the DTC study should be adjusted and organized to obtain predicted prospects for the achievement of a tentative target cost.

e. A DTC trade study is conducted on the selected DTC items which were designated to be checked in (d).

f. In allocating the present cost for the DTC trade study to the actual implementation activity, the technical documents necessary for their implementation as well as Form 15 "2-page plan for the estimate of development activity and cost(Form 15)" and Form 17 "Price/cost breakdown table " will be utilized.

Hereafter described, referring to samples.

g. Basic Policy at Each Phase

Articles after 8.1 concern statements of the main points of the contents of each phase, which are described in Form 1 "Steplist." By putting the contents of the steplist into phases, one can check the contents at the same time."

8.1 Phase for First Information Collection/Approval of Development DTC Implementation Plan Document

a. A development cost DTC implementation plan (draft) should be drawn up based on an illustrated PMD for development cost (rough draft) and the development cost DTC implementation plan (rough draft prepared beforehand). The plan (draft) should be approved by the concerned section and organization in order to implement the development cost DTC.

b. In this phase, the object item WBS which is included in the above implementation plan document, development activity PMD with picture and present estimate should be completed. This present estimate is based on figures which are obtained using a Engineering plan and materials that are obtainable at that point, and on the original design plan utilizing Form 9 “2-page plan for the estimate of development activity and cost.”

c. In this phase, element tests, etc., which are technically necessary or which require confirmation for DTC trade study in the following phases, take precedence in the implementation.

8.2 Phase for Formulating Ideas

Appropriate titles for this phase can be ‘Development method DTC trade study based on result of unit production’ or ’Development idea formulation DTC trade study.’

a. In this phase, a development method DTC trade study is conducted on the method/means of manufacturing product No. 0 for mass production. The method study includes development tests and prototypes that are subject to change depending on the result of the unit or development idea formulation DTC trade study.

8.3 Phase for structuring/Configuration drawing

a. A DTC trade study on configuration/structure of development object, which includes results of element test and engineering test based on formulated ideas of unit production machine or development. Based on the results, a DTC trade study of development method is conducted on changing prototype, manufacturing of product No. 1 which is included in development cost, and methods of development testing.

8.4 Phase for Secondary Information Collection

a. A development activity PMD with pictures should be reviewed based on the development method DTC trade up to the previous phase. Re-examination should be done to check for omissions, to see if development tests can be combined, or to see if a press forming mold and jig for prototype production can be manufactured and used for unit production, etc. The results of the examination should be reflected in the present cost status.

8.5 Phase of Basic Plan/Drawing and Detailed Plan Drawing

a. This phase examines the idea matrix in the DTC worksheet to see whether development method DTC trade can be still conducted based on the results of the plans of DTC trade on the development object or unit production. If there are items upon which a comparative plan can be created, a development cost DTC trade study is conducted.

8.6 Phase for detailed design/manufacturing drawing and plan

There is almost no theme for development cost DTC in this phase.

The target number of ideas for cost reduction of the development cost should be decided at a P-Drawing meeting and the reduction of development cost should be promoted with the generated target number.

As individual estimates of cost reduction take too much effort, a standard is set as _____ (number) M/H for each case and their result is estimated unless the reduction is particularly large.

8.7 Phase for Development Test and Manufacturing

a. The reduction of development cost is not expected in this phase. Therefore, effort is concentrated on the prevention of failure in development testing and manufacturing. The DTC of development cost is not conducted.

b. If something unexpected occurs, a DTC trade study as a means for its recovery is immediately conducted. Based on the result, the budget for recovery is allocated on approval.

8.8 Phase to Compile Know-how for Subsequent Developments

a. How to implement a DTC of development cost and improve the formats are compiled for reference in subsequent developments. The know-how is further compiled with a result report so that it can be easily and immediately found and applied.

9. DTC Activity and Cost Status Report

This article covers the items and the format of the DTC activity and Cost status report. The format shown in Table 1 should be used for the report. Reports should be done before the contract signing in each development phase. An interim report is made about once every two months and at the time of phased engineering review meeting. The final report is made on completion of the contract.

10. When Unexpected Costs Arise

(1) When unexpected conditions or situations occur under contract, they should be immediately reported in writing using a Engineering link sheet (Form 16), which is sent to the officer concerned or to the DTC officer in our company.

(2) On instructions from the section concerned of our Company, the DTC examination results and an estimate of the costs necessary to recover are submitted to our company to be scrutinized. In principle, the contents of this measure should be the result of the DTC examination if possible.

(3) The procedure for handling unexpected costs follows the "Procedure for Unexpected cost and Management in Implementation DTC for Development Cost" (Refer to Chapter 8 of Reference (2)a).

11. Bar (Gantt) Chart of DTC Implementation Schedule

Contents of steplist and preliminary operations are compiled in a bar chart referring to the 'implementation schedule' of Form 18.

12. Forms to be used

The following form is taken from the forms in Appendix E-6 attached to this book.

1. Steplist..... Form 1
2. DTC Organization Framework and Management..... Form 4
3. DTC Status Report of Development Cost (Example of DTC schedule curved line)… Form 6

Table 1　Form of DTC activity and Cost status report

Report name	What and when reported	Application	Form to be used
		Development cost	
DTC target allocation and cost status report	Total development cost	○	Form 6 （See Appendix 6A for completed sample）
The list of measures to reach the target cost	Each main WBS	○	Form 11
Key question sheet	End of each phase	○	Upper level DTC (secretary's office will prepare)

Appendix E-4

Procedure to Compile Verification Procedure Document for Unit Production Cost

Table of Contents

1. Style

1.1 Paper

The size of paper to be used for cost verification should be in the A-series, basically A4.

1.2 Compilation

The cost verification document should be compiled in the following order:

(1) Cover

(2) Contents

(3) Text

2. Samples

(1) Cover

To be compiled referring to Sample 1.

(2) Contents

To be compiled referring to Sample 2.

(3) Text

To be compiled referring to Sample 3.

(Example)

Document No.	

Verification procedure document for unit production cost of AAAA development

Approval signature of customer

Or higher level contractor
for lower level sub-contractor

／ ／ Rev. A
／ ／ Rev. 0

Approved by	Checked by	Created By

BBBB Co. Ltd.

Table of Contents (Sample)

0. Revision record

1. General

1.1. Purpose

(Samples)

This verification procedure document aims to clarify the policy and procedure for unit production cost based on Article 8.1 of the Design-To-Cost implementation standard “Cost Verification Procedure” in developing AAAA system.

(1) Estimating current present cost in each development phase

(2) Verification of target cost achievement using estimated current present cost.

Hereafter, operations (1) and (2) above will be referred to as "cost verification."

1.2 Scope

(Samples)

This document applied cost verification from the beginning* of the concept design of AAAA system to the completion of its development.

*Depending on the object, it should be consistent with the DTC implementation plan.

1.3 Definition

In this article, the terms defined by an article in the Design-to-Cost implementation standard (DTCN/DTC-STD-1) are used as such. Undefined terms should be defined as necessary.

1.4 Related documents and References

(1) Related documents

The following will be designated as related documents in this article and others will be included when necessary.

(a) Design-to-Cost implementation standard (DTCN/DTC-STD-1)

(b) Design-to-Cost program plan of development of AAAA

(2) References

The following will be designated as related documents in this article and others will be included when necessary.

(a) Advanced Project Management Methodology:

"The Thinking and Procedure for Design-to-Customers' Needs and Design-to-Cost" (ASCII Publishing Co.)

2. Basic Policy

The basic policy of cost verification should be described based on the following procedure.

(1) Verification of Target Unit Production Cost

(a) Undecided matters in detailed specification exist in or prior to the basic design phase.

Therefore, ① the number of items or quantity of parts is considered a parameter for processing M/H cost, and ② weight according to type or quality of material is considered a parameter for direct material cost.

Current present cost is obtained mainly by parametric estimate where the parameters above are multiplied by the basic unit. Individual estimates are made when necessary, such as for large functional equipment parts or special materials.

(b) At the beginning of detailed design, a present cost estimate is made mainly on the parametric estimate following the basic design phase. In order to grasp and understand and reduce possible deviations from the parametric estimate at the earliest point, a cost estimate of each item has to be made immediately for the parts of the detailed specification that have been clarified.

(c) In the prototype production phase, the current cost is estimated based on the cost results of the parts of the prototype which are common to the product made during unit production.

(d) In any phase, an estimate of price increases should be clearly stated in the escalation formula, etc., when the purchase prices of the components, the parts, and the material etc. are estimated. Particularly, when an item is developed by, or purchased from, a foreign manufacturer, the Buyers' Terms and Conditions/basic business contract for material transaction should be presented to avoid unusually large price increases above the normal escalation. In this way, consent of the other party, for example, the American company, is confirmed according to the rules of Uniform Code

Also, in order to agree to appropriate price changes (deletion, addition, replacement) by DTC, including the possibility of specification changes, the submission of a price/cost breakdown table for each tentative WBS allocation should be requested in the initial stages.

(e) Factors that require cost reductions should be selected by analyzing the difference between the estimated current present cost and the allocated target cost so that predicted prospects for the achievement of each target cost are obtained. Then the items necessary for examination and their expected effects, and the items that need to be adjusted for their achievement, etc., are clarified.

(f) As to an actual product, the achievement of the target cost, rather than the unit product cost results in development, should be assessed.

(g) The relationships between the material to be estimated and the estimating method for the estimate in each phase are shown in Table 1.

3. Method for estimating present cost at each phase

3.1 Estimating conditions

(1) Year in which price is set: 199x fiscal year

(2) Number of production units, decrease etc.: ___ units, rate of learning curve: ____%

(3) Units produced annually: _ units/year

(4) Approve rate of applied expenses: ____ yen/hour

(5) Exchange rate: ____yen/dollar

(6) Division of estimate: a) follows WBS

b) 1. direct material cost

2. processing man-hour cost

3. engineering man-hour costs

4. direct expenses

3.2 Method for estimating present cost of each cost item at each phase

Cost items for unit production are shown in Table 2.

Procedure for estimating processing man-hour costs is shown in Table 3.

Table 1 Present cost estimate at each development phase

Phase		Materials to estimate	Estimating work	Probable cost deviation
Basic design	Up to completion of concept establishment	Design, original for each WBS	Rough estimate	Large ↑
	Up to completion of conceptual drawing	Conceptual drawing WBS & DTC worksheet	Parametric estimate plus individual estimate	
	Up to completion of Basic plan	Basic plan drawing WBS & DTC worksheet	〃 〃	
Detailed design	Up to completion of plan/layout drawing	Plan/layout drawing WBS & DTC worksheet	〃 〃	
	Up to completion of manufacuring dwg.	Manufacturing dwg. WBS & DTC worksheet	Individual and total estimate	↓ Small
Prototype production	Prototype production phase	Manufacturing drawing	〃 〃	
	Review and corrective action phase	・ Result of test flight No. 1. ・ Action for production unit		

Table 2 Cost items for cost estimate (Unit production cost)

Main item	Item details	Contents
Direct material cost	Material	Cost of casting, forging, extrusion, non-metal material, supporting material
	Purchased part cost	Purchase cost greater than 10,000 yen ($100) for each domestically purchased part Purchase cost greater than 10,000 yen ($100) for each imported purchased part
	Small parts cost (Other than the above)	Small parts cost (other than the above)
	Excess cost	Failure cost, additional quality assurance cost, design change cost, stock not for use cost
	Not fly away cost	The part for other than flight
	Parts to be installed at launching site	Parts which are installed at launching site, e.g. ammunition and battery
Fabrication and assembly cost (including inspection cost)	Fabrication man-hours and cost	Fabrication of sheet metal, machining, bonding, welding, etc.
	Assembly man-hours and cost	Structural assembly, equipment installation, system functional test, etc.
Engineering cost	Engineering cost	The maintenance cost for manufacturing drawing by engineering
Direct expenses cost	Direct cost	
	Maintenance cost of jig	

Table 3　Cost estimate procedural element for man-hour cost

Category		Contents
Engineering information		Manufacturing information (eg. Manufacturing drawing) for parts fabrication and assembly
Mfg. man hours	Parts fabrication man-hours (A)	{(Part items for categorized process and material × average man-hours to manufacture) + (specific man-hours for large parts × quantity per aircraft)} × learning curve rate*
	Assembly man-hours (B)	{(Parts fabrication man-hours for each large assembly ×rate of assembly man-hours／fabrication man-hours for each assembly category) + final assembly man-hours} × learning curve rate
Manufacturing cost		[(A) + (B)] ×man-hour rate @_____yen(outside production rate_____%)

Note: (1) Use the average man-hours which are the lower of standard man-hours and actual man-hours.
(This policy will create one of the original points to create the ideas for cost reduction)

(2) *Items marked with an asterisk refer to large man-hour items which must be specifically estimated, e.g. N/C machine item, large parts, CFRP parts, etc.

Appendix E-5

Procedure to Compile Verification Procedure Document for Development Cost

Table of Contents

Note;

1. The difference in verification of the unit production cost and of the development cost in the development phase is as follows.

(1) Verification of unit production cost is to conduct final verification in development phase using the prototype result.

(2) Verification of development cost is an estimate for contract negotiations in each development phase and considered that each final verification is done before each phased contract.

1. Style

1.1 Paper

The size of the paper to be used for the cost verification should be in the A-series, basically A4.

1.2 Compilation

The cost verification document should be compiled in the following order.

(1) Cover

(2) Contents

(3) Text

2. Samples

(1) Cover

(2) Contents

(3) Text

To be compiled referring to samples.

(Sample)

Document No.	

Verification procedure document

for
AAAA Development Cost

Approval signature of customer

Or higher level contractor

for lower level contractor

／ ／ Rev. 0

／ ／ Rev. A

Approved by	Checked by	Created by

BBBB Co. Ltd,.

Table of contents

0. Revision record

1. General

1.1. Purpose

This verification procedure document aims to clarify the procedure for the prospects for development cost in each development phase on the premises of the phased contract in developing AAAAsystem, based on Article 8.1 of the Design-to-Cost implementation standard "Cost Verification Procedure." Hereafter the above operations will be referred to as "cost verification."

1.2 Scope

This document applies cost verification from the beginning* of the concept design of AAAA system to the completion of its development.

*Depending on the system, it can be started from the appropriate phase.

1.3 Definition

In this article, the terms defined by an article in the Design-to-Cost implementation standard (DTCN/DTC-STD-1) are used as such. Undefined terms should be defined as necessary.

1.4 Related documents and references

(1) Related documents

The following will be designated as related documents in this article and others will be included when necessary.

(a) Design-to-Cost implementation standard (DTCN/DTC-STD-1)

(b) Design-to-Cost program plan for the development of AAAA

(2) References

The following will be designated as a related document in this article and others will be included when necessary.

(a) Advanced Project Management Methodology:

"The Thinking and Procedure for Design-to-Customers' Needs and Design-to-Cost" (ASCII Publishing Co.)

2. Basic Policy

The basic policy of development cost verification should be described based on the following procedure.

(1) The verification of development cost is done separately in each development phase.

(2) In order to clarify the scope of objects of development cost, a development object item WBS and a development activity PMD are made and cost verification is conducted.

(3) Cost verification in each phase is complete with the contracted estimate of next phase.

(4) Estimate of the present development cost should follow the estimate material and operation that correspond to the grade of estimate (Note 1) shown in Table 2.1.
(Note 1) Follows the definition of the Design-to-Cost implementation standard.

(5) As for the development model, the prototype, the testing facility, and the manufacturing cost of the jig, etc., as many individual estimates as possible should be made at Grade 4 shown in Table 2.1. If this is impossible, it should be indicated by combining the rough and parametric estimates. The figures should indicate the grade of estimate in parentheses, that is, (Grade __).

(6) As to test cost, a parametric estimate is done in which the original unit is multiplied on results, taking the number of tests and the duration of the tests as parameters in each phase of the development test activity. At the level defined as Grade 4 in Table 2.1, they should be switched to individual estimates when possible. In any case, the grade of estimate should be indicated after the figure or in parentheses if it is written in the upper right area outside the estimate document or price/cost breakdown table.

Table 2.1 Grade of estimate for present cost estimate

When to estimate / Phase and object to estimate	Conceptual design before contract of next phase	Basic drawing phase before contract of next phase	Detailed drawing phase before contract of next phase	Manuf. Drawing before contract of next phase	Review phase before contract of next phase
Conceptual drawing	4(Note1)	Verified	Verified	Verified	Verified
Basic plan drawing	5	4(Note2)	Verified	Verified	Verified
Detailed plan drawing	5	5	4(Note2)	Verified	Verified
Manufacturing drawing	5	5	5	4(Note2)	Verified
Review	5	5	5	4	4(Note2)

(Note 1) Immediately before the contract at the basic design phase, the contents of the operation to be done in basic design are known to the accuracy of estimate grade 4 (for contract estimate).

(Note 2) The contents of the operation of the test concerned are understood at the level of the detailed plan drawing (for contract estimate).

(7) In order to obtain the predicted prospects for the achievement of each target cost from the difference in the estimated current present cost and allocated target cost, the necessary conditions for the achievement of the target cost are classified and items that need to be examined or adjusted for the achievement are clarified.

(8) As for long-term development, our Buyers' Terms and Conditions/basic contract for material transaction should be presented to the other party. It includes a standard dollar rate and escalation method, or a fixed price in the initial estimate of the purchase price of parts when selecting imported components, parts, and materials etc. for any phase, in order to prevent sudden increases in parts' prices. The consent of the other party is confirmed by such means as the Uniform Commercial Code in the case of the United States. Precautions should be taken when selecting dealers and route of purchase to avoid a price increase in parts at the time of actual purchase.

Also a price/cost breakdown table of the initial estimate should be requested as specifications may change. Deletions, additions, and replacements in the list due to any changes in specification must be clearly specified.

3. Method for estimating present cost at each phase

3.1 Estimating Conditions

(1) Year in which price is set: 199x fiscal year and increase in annual standard rate ___%
(2) Approved rate of applied expenses: ____ yen/hour
(3) Exchange rate: ___ yen/dollar
(4) Division of estimate:
a) follows WBS
b) 1. direct material cost
2. processing man-hour cost
3. engineering man-hour cost
4. direct expenses

3.2 Procedure for estimating cost item and phase

(1) Development cost

Example of cost items is shown in Table 2.

Procedure for estimating processing man-hour cost is shown in Table 3.

Costs should be estimated following a procedure suited to each company while referring to Tables 2 and 3.

Table 1 Present cost estimates for development model, test model, test facility, jig, etc., in each phase

Phase		Material to estimate	Estimating work	Probable cost deviation
Basic design	Up to completion of concept establishment	Design original for each WBS	Rough estimate	Large ↑
	Up to completion of conceptual drawing	Conceptual drawing WBS& DTC worksheet	Parametric estimate and individual estimate	
	Up to completion of basic plan drawing	Drawing of basic plan drawing WBS & DTC worksheet	〃 〃	
Detail design	Up to completion of plan／layout drawing	Plan／layout drawing WBS & DTC worksheet	〃 〃	↓ Small
	Up to completion of manufacturing drawing	Manufacturing dwg. WBS & DTC worksheet	Individual and total estimate	

Table 2 Items for cost estimate (Development cost)

Main item	Item details	Contents
Direct material cost	Material	Cost of casting, forging, extrusion, non-metal material, supporting material
	Purchased parts cost	Purchase cost greater than 200,000 yen ($2,000)for each domestically purchased part Purchase cost greater than 200,000 yen ($2,000) for each imported part. Cost to be broken down into material, fabrication, assembly, test man-hours, and expenses.
	Small parts cost (other than the above)	Small parts cost (other than the above)
	Excess cost	Failure cost, additional quality assurance cost, design change cost, stock not for use cost
	Not fly away cost	Parts for other than flight configuration
	Parts to be installed at launching site	Parts which are installed at launching site, e.g.,. ammunition and battery
Fabrication and assembly cost (including inspection cost)	Fabrication man-hours and cost	Fabrication of sheet metal, machining, bonding, welding, etc.
	Assembly man-hours and cost	Structural assembly, equipment installation, system functional test, and etc.
Test site cost	Direct M/H cost	Direct man-hour cost for test site
	Engineering M/H cost	Engineering M/H cost for test site
Engineering cost	Engineering M/H cost	Cost to make drawing, test plan and procedure and Test report
Direct cost	Direct cost	
	Maintenance cost of jig	

Table 3 Cost estimate procedural elements for man-hour cost

Category		Contents
Engineering information		Manufacturing information (eg. Manufacturing drawing) for parts fabrication and assembly
Mfg. man hours	Parts fabrication man-hours (A)	{(Part items for categorized process and material × average man-hours to manufacture) + (specific man-hours for large parts × quantity per aircraft)} × learning curve rate*
	Assembly man-hours (B)	{(Parts fabrication man-hours for each large assembly ×rate of assembly man-hours／fabrication man-hours for each assembly category) + final assembly man-hours} × learning curve rate
Manufacturing cost		[(A) + (B)] ×man-hour rate @_____yen(outside production rate_____%)

Note: (1) Use the average man-hours which are the lower of standard man-hours and actual man-hours.
(This policy will create one of the original points to create the ideas for cost reduction)

(2) *Items marked with an asterisk refer to large man-hour items which must be specifically estimated, e.g. N/C machine item, large parts, CFRP parts, etc

Appendix E-6

Forms

To be enlarged by copier to A4 or A3 size

1. Steplist (phased plan)
2. 3-phase improvement form

2A. 5-phase improvement form

3. Table of WBS (Work Breakdown Structure)
4. DTC Organization framework and management
5. DTC cost status report (for unit production cost)
6. DTC status report of development cost (Example of DTC scheduled curve line)

6A. DTC status report of development cost (Example of present cost, resultant contract line)

7. DTC theme/idea proposal sheet (for unit production cost)

7A. DTC theme/idea proposal sheet (for development cost)

8. WBS phased theme list table to reach the objective target
9. Theme/idea proposal sheet
10. Theme/Idea Promotion Table
11. Theme/Idea Promotion Table
12. Example of DTC worksheet (for hardware)

12A. Example of DTC worksheet (for computer software)

13. Theme/idea action expediting list

13A. Process expediting list

14. Predicted report to reach the final target cost
15. 2 page plan of development activities estimate
16. Engineering Link Sheet
17. Price cost breakdown table (specified form for filling price cost breakdown)
18. Implementation plan sheet
19. Work summary sheet

Form 1 Steplist (Phased Planning form)

Subject

Subtitle (Keyword)

Steplist (Phased plan)

Authorized by: Date:

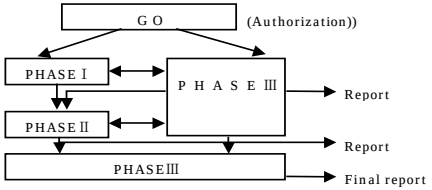
Production:

		A	B	C	D	E	F	G	H	I
		Step title	Input		Output		Other conditions	When approve the output and schedule	Who approve the outoput and schedule	Actual decision date and notes
			Item	Pre-assurance Activity	Item	Post-assurance Activity				
1	1st information collecting phase									
2	Basic Idea									
3	Breakdown structure (Structuring)									
4	2nd information collecting phase									
5	Basic matter or basic design									
6	Detailed matter or detail design									
7	Implementation get subjective result									
8	Review									

Form 2　3-Phase Improvement

Subject

Key Word
(In brief to…)



Approved by：

Promoter：

PHASE Ⅰ (Effective countermeasures can be taken at once and temporary ones leading up to PHASE Ⅱ)			PHASEII (Countermeasure to be taken as soon as possible)			PHASEIII (Final measure to be achieved)		
Item to be done	Conditions and preparation	Assigned person and completion date	Item to be done	Conditions and preparation	Assigned person and completion date	Item to be done	Conditions and preparation	Assigned person and completion date

Form 2A 5-Phase improvement

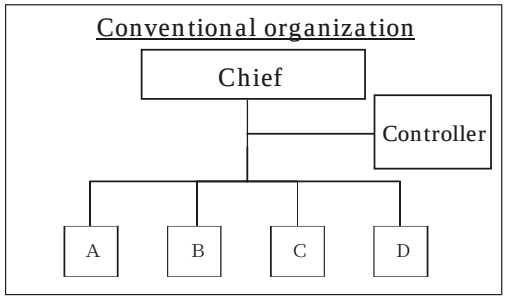
Subject：
Key Word：
(In order to…)

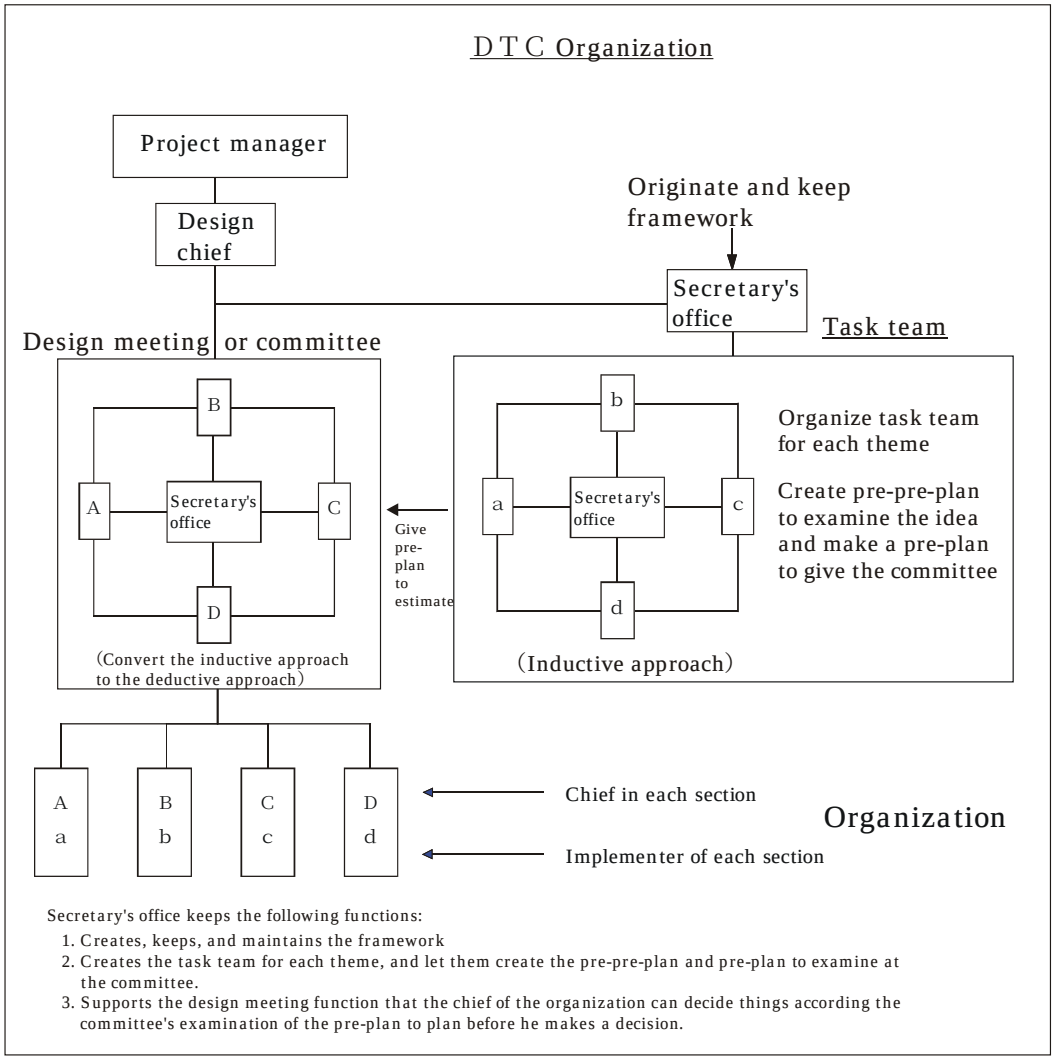
Approved by：
Promoter：

PHASE Ⅰ			PHASE Ⅱ			PHASEⅢ Countermeasures			PHASEⅣ Countermeasures			PHASE Ⅴ Countermeasures		
Item to be done	Conditions and preparation	Assgn. compl. date	Item to be done	Conditions and preparation	Assgn. compl. date	Item to be done	Conditions and Preparations	Assgn. compl. date	Item to be done	Conditions and preparation	Assgn. compl. date	Item to be done	Conditions and preparation	Assgn. compl. date

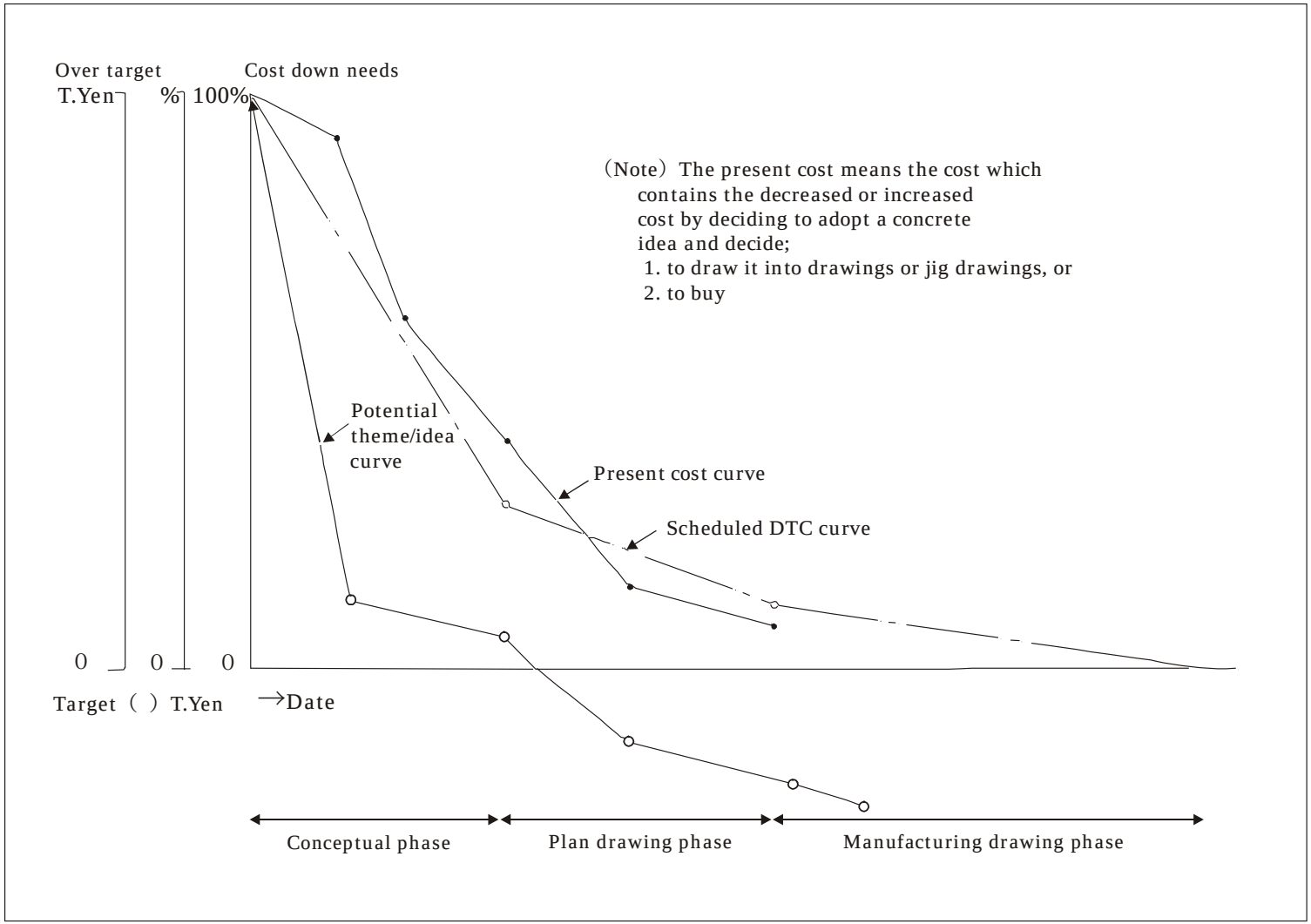
Form 3 Table of WBS (Work Breakdown Structure)

Form 4 DTC organization framework and management

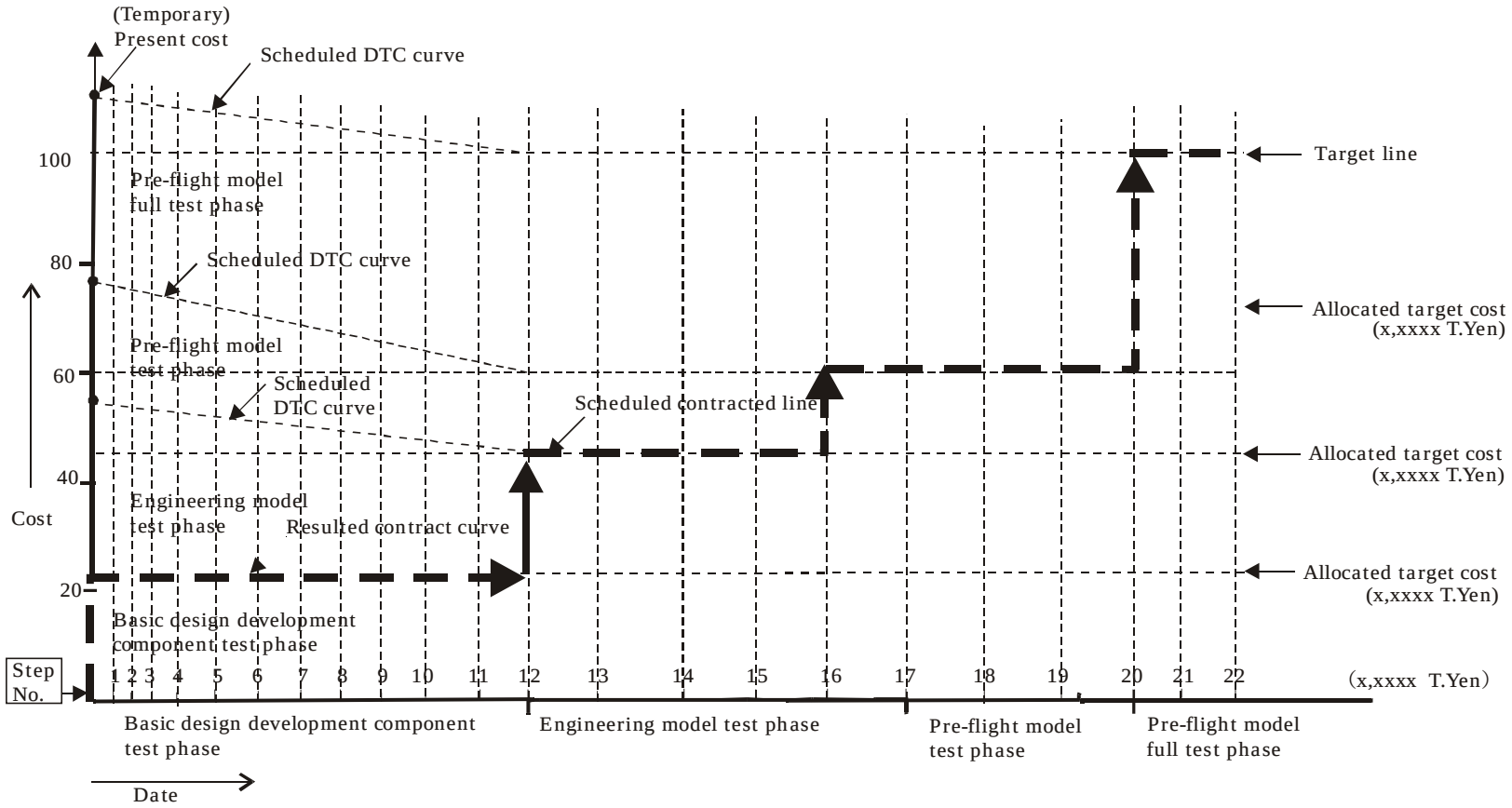




Form 5 DTC cost status report (For unit production cost)



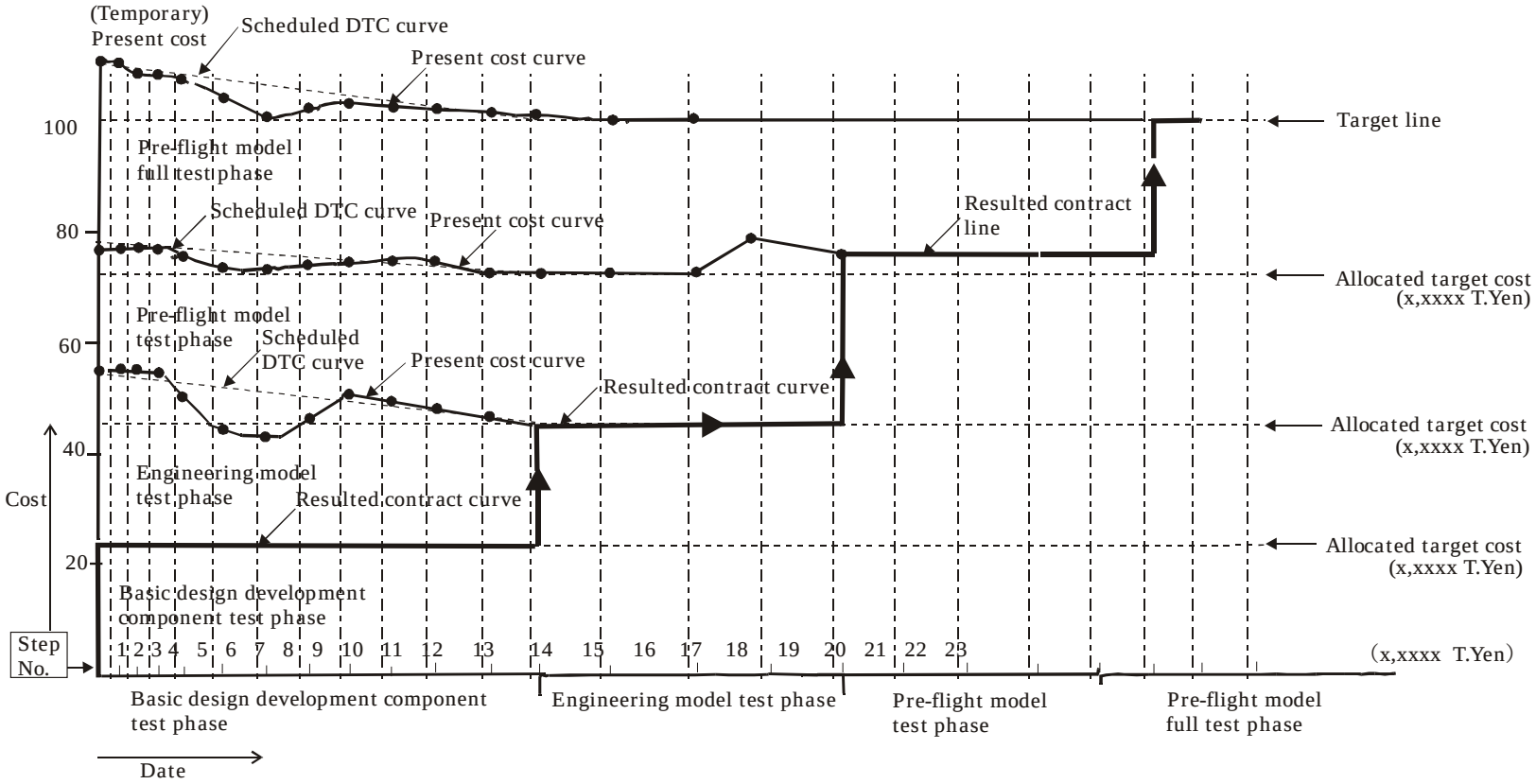
Form 6 DTC status report of development cost (Example of DTC scheduled curve line)



WBS No.,Name ○○○○

Cost status report of DTC for development cost

Form 6A DTC status report of development cost (Example of present cost, resultant contract line)



WBS No.,Name ○○○○
Cost status report of DTC for development cost

Form 7 DTC theme/idea proposal sheet

ACTION → → → → →

(Theme／Idea proposal sheet)						Reg.No.
Theme*	Company			Proposer Date TEL		
WBS № Nomenculature or System name	Phase to Examine	0	I	II	III	IV

1. Theme(Draft)/Idea(Sketch as necessary)

2. What is the purpose or prospective effect?*

3. What conditions must be satisfied to implement proposal?

4. What led you to create this proposal?

Result of investigation and/or examination	Theme accepted
	Idea accepted
	Pending (up to)
	Not adopted

Note:
1. No need to complete all columns(columns marked with an asterisk*/must be completed.)
2. Do not hesitate to propose even if your idea may already have been proposed or is being considered.
3. Proposal must be forwarded to ( ).
4. This proposal will be processed by "DTC, proposal and investigation/examination practice"

Follow up
. .
. .
. .

Form 7A DTC theme/idea proposal sheet (For development cost)

Action → → → → →

Development cost DTC Theme/idea proposal sheet						Reg. No.	
Theme*	Company					Proposer Date Tel	
WBS № Nomenclature or name	Phase to examine						
	Effect phase						

1. Theme (draft)/idea (Sketch as necessary)

2. What is the purpose or expected effect ? *

3. What conditions must be satisfied to implement proposal ?

4. What led you to create this proposal ? *

Result of investigation and/or examination	
	Theme accepted
	Idea accepted
	Pending(up to)
	Not adopted
Note 1. No need to complete all columns. (*marked columns must be filled) 2. Do not hesitate to propose the idea or theme even if it is already being considered or has been proposed before. 3. Proposal must be forwarded to ( ). 4. This proposal will be processed according to "DTC proposal and investigation/examination practice".	Follow-up
	. .
	. .
	. .

Form 8 WBS/Theme Phasing management sheet (WBS, phased theme list table to reach the target cost

WBS phased theme list table to reach the objective target

Note1. Mark the item which will be examined with a ○.
Mark the item which will be adopted with a ◎.
Mark the item which will not be examined or has been rejected with an ×.
Note2. Reduced or increased effect in unit production cost.

Nomenclature (　　)　　Company (　　)

W B S		Image／Sketch	Conceptual design phase (／) Note1)		Note2)	Plan drawing phase (／)			Mfg. dwg.／Planning phase (／)			Prod./Test/Review phase (／)			For each WBS
Name (WBS No)	Name (WBS No)		No.	(PHASE Ⅰ)	Expected effect (T.Yen)	No.	(PHASE Ⅱ)	Expected effect (T.Yen)	No.	(PHASE Ⅲ)	Expected effect (T.Yen)	No.	(PHASE Ⅳ)	Expected effect (T.Yen)	Total of Expected effect (T.Yen)
		Total expected effect													

Form 9 Theme/idea registration and promotion sheet

WBS	Item	Reg. No.		Theme/idea	Expected effect	Who proposed	Phase to exam.	Go exam. date	Who assigned	Necessary conditions to implement proposal	Result of adjusted conditions	Completion date	Resultant effect

Form 10 Theme/idea promotion table to reach the target cost (For unit production cost)

（For DTC unit production cost）

List of measures to reach the target cost		WBS No.	Nomenclature	Company name	(／)

	WBS		Theme	Details of implementation or concrete contents	Expected effect (T.Yen／AC)	Promoter	Necessary conditions to implement the theme	Result of adjusted conditions	Estimated completion date	Resultant of effect

Form 11 Theme/Idea Promotion Table to reach the target cost (For development cost)

(For Design-To-Development-Cost)

List of measures to reach the target cost	Phase to examine	Objective WBS	Activity No.	Nomenclature	Company／Dept.	Assigned person	(/)

Item No.	WBS		Measure	Implementation details or concrete contents	Expected effect		Assigned person	Necessary conditions to implement the measure	Result of adjusted conditions	Date of adoption	Resultant	
					Phase	Effect					Phase	Effect

When it is difficult to predict the measurable effect in a numerical value, it is OK to put →

Extra large	Large	Medium	Small	Extra small
A	B	C	D	E

into the effect column.

Form 12 Example of DTC worksheet (For computer)

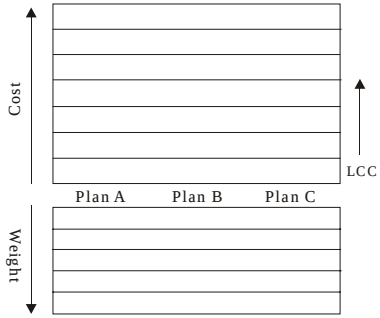
DTC WORK SHEET		R'qt Check	Basic Func.	Ideas creation	Ideas comparison	Evaluation	Judge	Agree: Leader	Agree: Cost Gp.	Agree: Chief	Approval: Planning	Approval: Purchasing	Person in charge		Revision				Page
	Sch.Plan												Control No.		Drafted				
	Act.Date														Reviewed				
															Approved				

WBS Name	WBS No.	Theme	Basic Function

Target cost			Idea matrix: Type	Components	Materials	Mfg.ways	Sub-con etc.	Plan A: Title	Plan B: Title	Plan C: Title	Sign column
Cost	Mfg.	M/H						(Sketch)	(Sketch)	(Sketch)	Drafted
	Material										
	Total										Checked
Weight		Kg									
Reliability											Approved
Maintainability											
											Agreed
(Other Requirement)							Explanation of contents and its distinctive charactor				

Notice on estimations	Cost Estimation (Average evaluation cost per XXX A/C)	Plan A: Mfg.M/H (H)	Plan A: Material	Plan B: Mfg.M/H (H)	Plan B: Material	Plan C: Mfg.M/H (H)	Plan C: Material	
The estimated value of differences only is acceptable.								Drafted

Trade-off graph weight & cost



Eval.Item	Wt.Coef.	Plan A: Estimation	Ranking	Point	Wt.*Point	Plan B: Estimation	Ranking	Point	Wt.*Point	Plan C: Estimation	Ranking	Point	Wt.*Point	
Cost		$				$				$				
Weight		Kg				Kg				Kg				Checked
Total														Agreed
Schedule & Comment														
Evaluation, Comment														
Total ranking														

Selected Idea	General comment & Conditions of selection	Sign	Chief Eng.	Sub-Chief	DTC suport

Form 12A Example of DTC worksheet (For computer system)

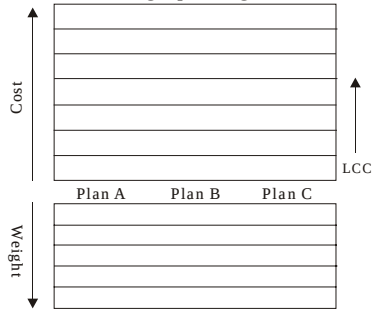
DTC WORK SHEET		R'qt Check	Basic Func.	Ideas creation	Ideas comparison	Evaluation	Judge	Agree: Leader	Agree: Cost Gp.	Agree: Chief	Approval: Planning	Approval: Purchasing		Person in charge		Revision				Page
	Sch.Plan													Control No.		Drafted				
	Act.Date															Reviewed				
																Approved				

WBS Name	WBS No.	Theme	Basic Function

Target cost			Idea matrix: Type	Components	Materials	Mfg.ways	Sub-con etc.	Plan A: Title	Plan B: Title	Plan C: Title	Sign column
Cost	Mfg.	M/H						(Sketch)	(Sketch)	(Sketch)	Drafted
	Material										
	Total										Checked
Performance	Response										
											Approved
Reliability	e.g. MTBF										
Maintainability	Time to restore										Agreed
Operability											
(Other Requirement)							Explanation of contents and its distinctive charactor				

Notice on estimations	Cost Estimation (Average evaluation cost per XXX A/C)	Plan A: Mfg.M/H (H)	Plan A: Material	Plan B: Mfg.M/H (H)	Plan B: Material	Plan C: Mfg.M/H (H)	Plan C: Material	Sign column
The estimated value of differences only is acceptable.								Drafted
								Checked
								Agreed

Trade-off graph weight & cost



Eval.Item	Wt.Coef.	Plan A: Estimation	Plan A: Ranking	Plan A: Point	Plan A: Wt.*Point	Plan B: Estimation	Plan B: Ranking	Plan B: Point	Plan B: Wt.*Point	Plan C: Estimation	Plan C: Ranking	Plan C: Point	Plan C: Wt.*Point
Cost		$				$				$			
Weight		Kg				Kg				Kg			
Total													
Schedule & Comment													
Evaluation, Comment													
Total ranking													

Selected Idea	General comment & Conditions of selection	Sign	Chief Eng.	Sub-Chief	DTC suport

Form 13 Theme/idea action expediting list

Action expediting list WBS( ) Phase ( ) Assigned person ( )

Reg. No.	Sub. No.	Cl	Theme/idea	Proposer	GO-A-HEAD date to examine	Conditions and notes	Action	Need date	Est. completion date

Form 13A Process expediting list

Process expediting list

Item No.	Reg. No.	Class	Item or part No.	Originated date	Date originally needed	Serial No.	Conditions or notes	Action process	Need date	Est. Completion date
Model	Promoter/Coordinator		Promoter／Coordinator							

Form 14 Report on prospects of reaching the final target cost

Summary of prospect report to reach the target cost

Scheduled date for reporting on DTC scheduled curve

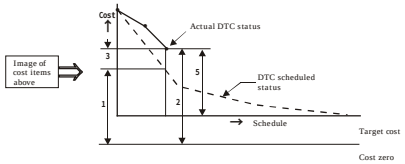
WBS No._____ WBS name_____ Company _____ Date ____

	Item	Contents
1	Scheduled value on DTC scheduled curve	How much more cost reduction is obtained than the scheduled cost reduction value on the DTC scheduled curve ? ☐More ☐Less _____$
2	Present cost status	How much cost reduction must be done before reaching to the target cost? _____$
3	State the reason why	(Answer if the cost reduction scheduled on DTC scheduled curve was not obtained)
4	Cost reduction needs to reach target	_____ K$
5	Prospected effect by created theme/idea up to this date	*1

	No. of items	Possible Effects	Reali-zation %	Possible effects × Realization %
Unadopted itams		———	0 %	———
Adopted items		$	%	$
Hopeful Items		$	%	$
Before exammination		$	%	$
Total		$	%	$

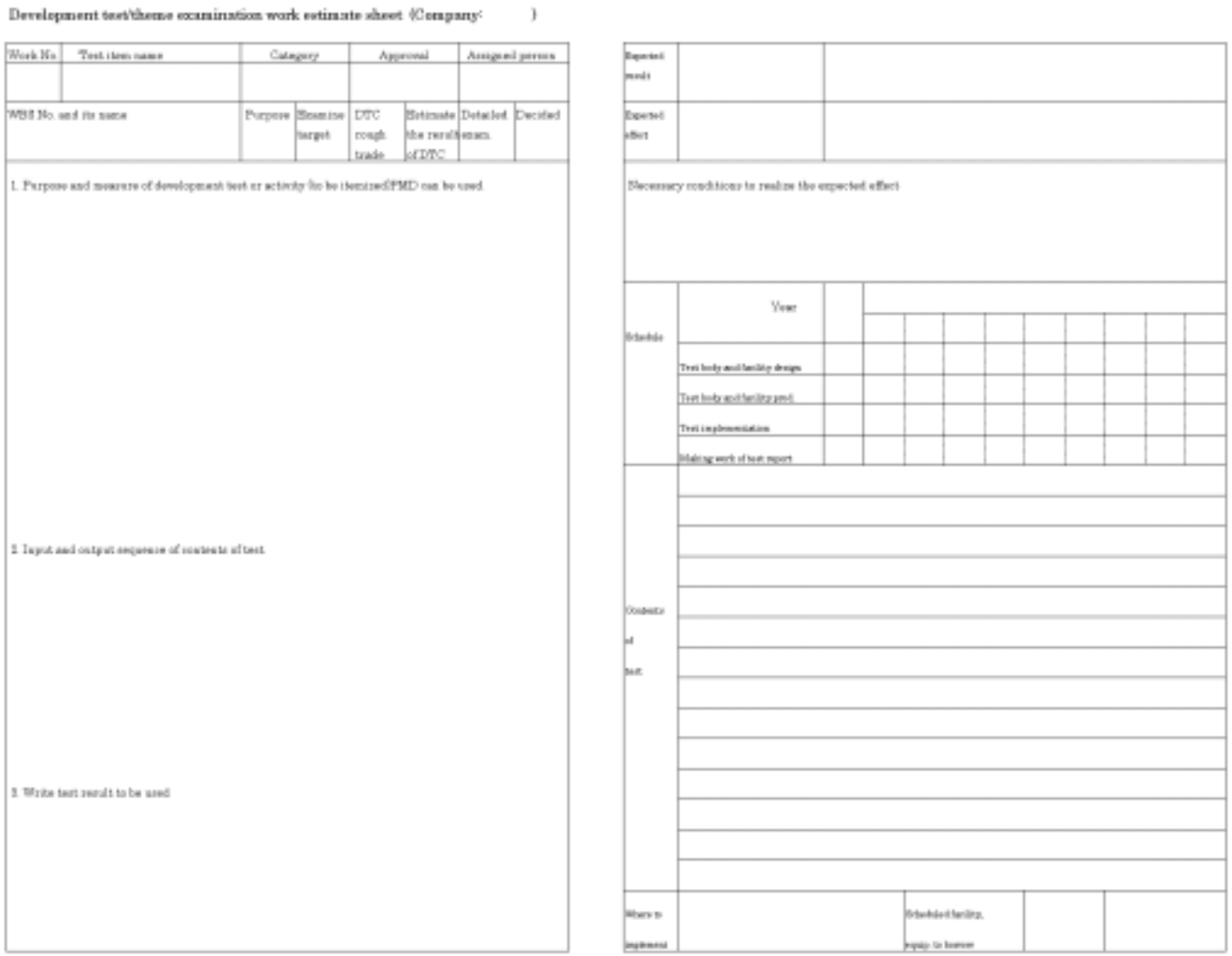
Note1.Prospected value must be report including G.C.I.P(In the case of in-house net value)
Note2.The hopeful item must include all prospected items, prospected value must not include risk cost.

6	Positive key action and schedule to reach the target cost and schedule	



Present cost is : _____ Yen less than scheduled cost status on this day.
_____ Yen more than scheduled cost status on this day.

Form 15　2 page plan of development activities estimate (1/2)



Development test/theme examination work estimate sheet (Company:)

Work No.	Test item name	Category		Approval		Assigned person	

WBS No. and its name	Purpose	Examinee target	DTC rough trade	Estimate the result of DTC	Detailed mean.	Decided

1. Purpose and measure of development test or activity (to be itemized/PMD can be used

2. Input and output sequence of contents of test

3. Write test result to be used

Expected result		
Expected effect		

Necessary conditions to realize the expected effect

Schedule	Year									
	Test body and facility design									
	Test body and facility prod.									
	Test implementation									
	Making work of test report									

Contents of test

Where to implement		Scheduled facility, equip. to borrow		

Form 15　2 page plan of development activities estimate (2/2)

Format 15(2/2)　2-phase plan and estimation of development cost

Image sketch	Cost item		Man-hours M/H	Man-hours Day	Man-hours M/H	Cost T.Yen	Scheduled year T.Yen	Scheduled year T.Yen	Contents	Note Man-hour rate	Note Year	Note Year
1. Test body	Reg cost: Calculation						(Yen)	(Yen)				
	Reg cost: Drawing						(Yen)	(Yen)				
	Reg cost: Engineering work						(Yen)	(Yen)		Engineering	Yen	Yen
	Reg cost: Adjust. of test facility						(Yen)	(Yen)		A Dept.	Yen	Yen
	Reg cost: Test implementation						(Yen)	(Yen)				
	Reg cost:						(Yen)	(Yen)				
	Reg cost: Total						(Yen)	(Yen)				
	Test body cost: Fabrication cost	I					(Yen)	(Yen)				
	Test body cost: Jig cost	II					(Yen)	(Yen)				
	Test body cost: Assembly cost	III					(Yen)	(Yen)				
	Test body cost: Material cost											
	Test body cost: Purchased parts cost											
	Test body cost:											
	Test body cost: Total											
2. Test method	Test facility cost: Fabrication cost	IV					(T.Yen)	(T.Yen)				
	Test facility cost: Material cost											
	Test facility cost: Purchased parts cost											
	Test facility cost:											
	Test facility cost: Total											
	Final assembly and adjustment	V					(Yen)	(Yen)				
	Test implementation						(Yen)	(Yen)				
	After treatment of test						(Yen)	(Yen)				
	Man-hour total						(Yen)	(Yen)				
	Material total											
3. Test facility	Other expenses: Drawing cost											
	Other expenses: Travel costs									General facility equipment		
	Other expenses: Packing and transport									1		
	Other expenses: Cost of renting computer									2		
	Other expenses:									3		
	Other expenses: Total									4		
	Material and expense total									5		
	Total: G.C.P						Grand total			6		
	T.Yen: T.Yen						T.Yen			7		

Challenging target cost				

Form 16 Engineering link sheet

Format 16　Engineering sheet

Engineering sheet

		Reg. Serial No.		
		Date; / /		
(To)	(From) Department: Group: Section:	Project Section Manager	Leader	Assigned. person
(Title) Information Query Request		Answer before Year month day		No. of attached documents
(Memo.)				

Copy Distribution

× × × × × × × × × × ×

Total

(Answer)

Your distribution

× × × × × × × × × ×

Total

○Please write answer on this sheet and return with responsible person's signature to (　　).

○ Please use your distribution column for your purpose.

Date; / /		
		Assigned person
Number of attached documents		

Form 17 Price cost breakdown table

Price cost breakdown table

Prepared by | Purpose | _ of _

Part No. | Part name | Manufacturer | Refered Std | Grade of estimate( )

Note: (1) Category means machining, assembly work . (2)(3) Enter standard M/H. (4) Learning coefficient of difficulty/ease and current direct labor rate are to be multiplied by standard M/H, and an explanation of the content of coefficients is to be made as attached data. | Optional item( ) | Prepared date / /

Item No.	Part or process No.	Nomenclature	Qty per set	Eng. code	Direct material cost						Processing cost				Outside production cost	Cost for development of tools and equipment			
					Material description	Unit	Standard quantity	Unit price	Material cost	Purchased parts cost	Man-hours			Processing cost		Item name or tool No. and equip No.	Price or expense	Amortizing number	Average amort. cost
											Gang-cycle	Set(2)	Rout(3)						
	Net amount																		
	Excess(%)																		
	Total																		

Royalty Yen | Delivery cost Yen | Others Yen | Total Yen | GCIP(%) % | Grand total Yen

Form 17A Price, cost breakdown table with start and complete set back schedule

Price cost schedule breakdown table

Prepared by ______ Purpose ______ _ of _

Part No. ______ Part name ______ Manufacturer ______ Ordered (Rs) ______ Grade of estimate( )

Note: (1) Category means machining, assembly work . (2)(3) Enter standard M/H. (4) Learning coefficient of difficult phase and current direct labor rate are to be multiplied by standard M/H, and an explanation of the content of coefficients is to be made on attached data.

Optional item( )

Prepared date / /

Item No.	[illegible]	Part or process No.	Nomenclature	Qty per unit	Eng code	Direct material cost								Processing cost							Outside			Cost for development of tools and equipment			
						Material description	Unit	Standard quantity	Unit price	Material cost	Purchased [illegible]	Set back		Man-hours			Processing cost	Set back		production cost	Set back		Item name or tool No. and equip No.	Price or expense	Amortizing number	Average [illegible]
												Start	Complete	Category	[illegible]	[illegible]		Start	Complete		Start	Complete				
		Net amount																								
		Excess(%)																								
		Total																								

Royalty ______ Yen Delivery cost ______ Yen Others ______ Yen Total ______ Yen GOP(%) ______ % Grand total ______ Yen

Form 18 Implementation Plan Sheet

Date: . .

Implementation Plan

Subject		Dept. Chief	Manager	Co-ordinator

Division

Details of process items and/or contents	Scheduled Serial or Lot No.	Target	Implementation Schedule	Personnel Concerned/Assigned

Necessary conditions and notes to attain the target	Result of adjusted conditions

Form 19 Work summary sheet

Work summary sheet

Approval	Leader	Created by
. .	. .	. .

WBS No. Name			Master schedule date		Implementation schedule		Group	Assigned person
			Start	Complete	Start	Complete		
Output of work								
Input of work								

Work item and content (as concrete as possible)

Note	Group related to this work Mark○		
	Group	Input	Output
	Plan/cont.		
	Cost		
	Aerodyn.		
	Structure		
	Equipment		
	Electrical		
	Software		

Appendix E-7

Operation Instructions to Start DTC in Design Work

1. Control flow of whole design operations including DTC
2. Proposal of DTC, weight reduction etc. theme/idea proposal sheet and management procedure
3. DTC trade study procedure (Form to be used)

Document No. DTC-001	Title Control flow of all design operations including DTC	Approved by	Controlled by	Compiled by
		Person in Charge of Agreed Cost Control		

1. **Control Policy**

(1) All items related to a development are compiled into a WBS table. Control with superior visibility is to be conducted primarily in a visibility room.

(2) Operations are established at each level (individual, group, party, team) with a structured control to be implemented.

(3) Proposition of theme and problems, as well as a schedule follow-up, are handled primarily through internal control within each team. However, when it is a matter of concern for all teams, the theme or problem should be solved immediately through a design meeting.

2. Significance of Control Methods that Use a Development/Design WBS

(1) A Development/Design WBS is a structured table of items that defines the whole system of project AAAA and indicates the mutual relationship between items by including all those operational items required in a development.

The WBS is to be used as a tool for controlling and eliminating oversight, retreat, duplication, etc., in operations.

These are aimed at securing execution of the centralization of information and report system and at clarifying responsible sections.

(2) There are two types of Development/Design WBS, a MIL-STD-881A (Parent-Child model) and a PMD model. Both models should be used, combining their features.

3. Preconditions for Implementing Control

(1) A team leader is responsible for reporting on the implementation and operational status of a Development/Design WBS at the team level.

(2) The operation of each team and the items to be examined will be controlled by the WBS. Through this, transmission of information will be adjusted. For this purpose, a planning sheet, a work summary sheet, a necessary disposition worksheet, and other related forms, will be unified.

(3) A DTC trade study expedition sheet will be compiled and controlled for each operational item (which is important in cost control).

4. Control Procedure (flow of control is shown in Fig. 1)

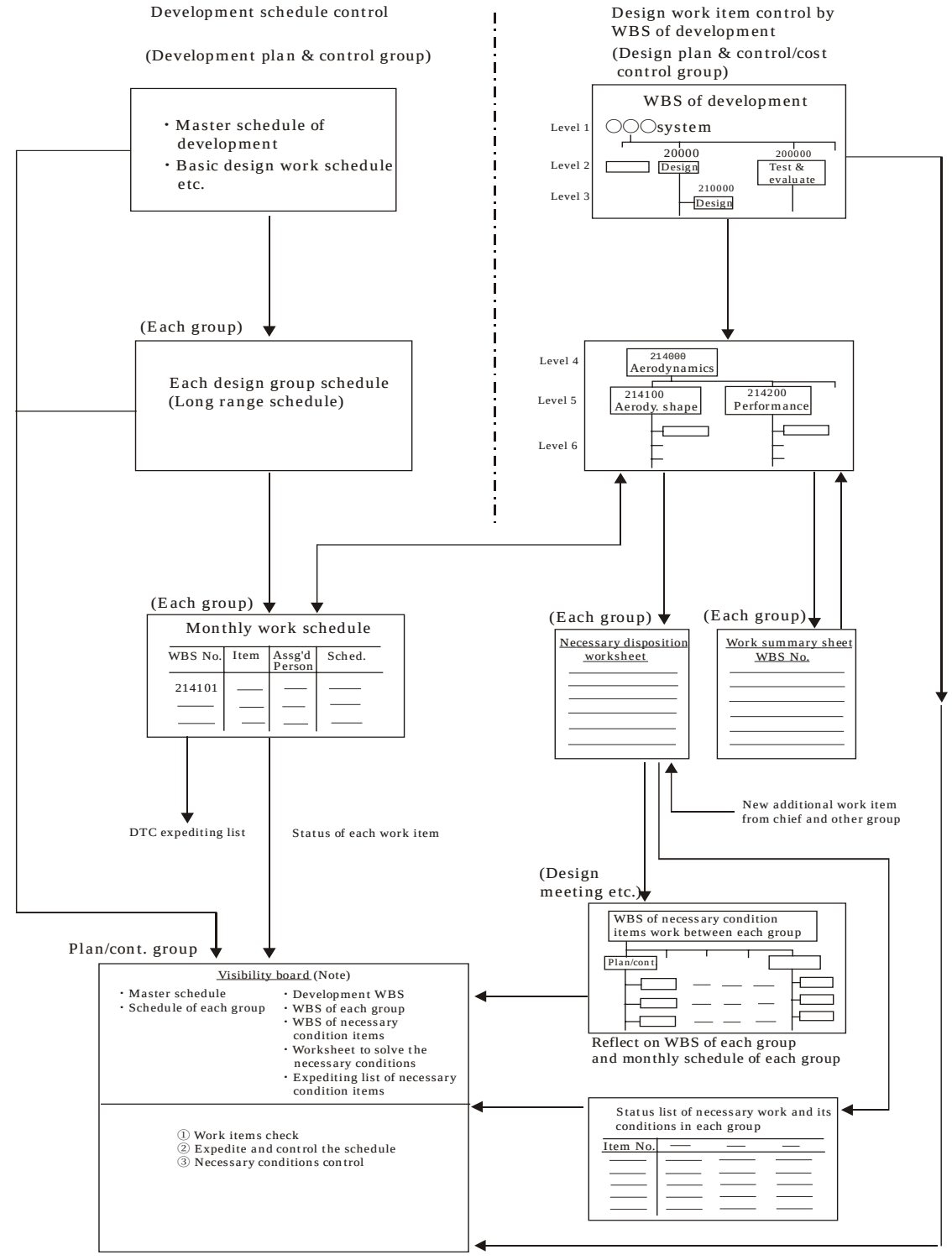
(1) A WBS will be deployed in detail and implemented by each team, following the establishing the Base line WBS by WBS officer

(2) Each team will compile a work summary sheet for each operation with a “monthly work schedule” to follow.

(3) A team will compile a “necessary disposition worksheet” of items that need to be disposed of following a major change in an operational schedule, and for new items to be taken care of. Other teams, on the other hand, will identify and compile lists of those problems that might affect them. Each team will adjust schedules mutually and conduct operations jointly, as well as assign operations to each of the other teams.

(4) Upon consideration of the operational procedure, status of each operation, an overall schedule sheet (Master schedule of development and basic design work schedule) and WBS should be completed.

Fig. 1 Management flow of total design work



(Note) Visibility board means the visibility board in meeting room in which every people easily discuss anything by looking its visibility board.

No.	Title	Approved by	Controlled by	Compiled by
DTC-5	DTC weight reduction theme/idea proposal sheet and its disposition			

1. Purpose

This procedure for DTC/weight reduction theme/idea proposal and management establishes to achieve target figures.

2. Related Documents

(1) DTC-001 “Control Flow of Whole Design Operations Including DTC”

(2) DTC-002 “Procedure to Select DTC/LCC Trade Theme During Design Work” Refer to Table 7.2-11 in related document (4)

(3) DTC-003 “Procedure for Implementing Design Meeting”

(4) Advanced Project Management Methodology;
"Thinking and its Procedure for DTCN and DTC"

3.Concerned Sections

(1) Each design team

(2) Sections involved in design, production control, material and quality control

(3) Cost Control Team (Secretary)

4. Outline of Proposal and Its Disposition

4.1 Proposals from Design Team

(1) Each design team (including Cost Control Team) will compile a WBS of items for study according to the related document (1) and register them in order to achieve target figures for cost, weight, etc.

Based on the WBS table, a detailed sub-division is made regarding study according to the related document (2) that will be integrated into the design work schedule.

Those items considered to be appropriate themes/ideas for study, but not suitable for inclusion in the WBS table for procedural reasons, should be documented in an attached "DTC Weight Reduction Theme/Idea Proposal Sheet” to be submitted to the Cost Control Team.

The disposition procedure after this is as follows.

4.2 Proposals from the Manufacturing Planning, Material, Quality Control Sections of Each Company

The Cost Control Team acts as a Secretary and handles the following procedure.

(1) Proposal:

Necessary information will be documented in the attached "DTC Weight Reduction Theme/Idea Proposal Sheet” and will be submitted to the Cost Control Team.

(2) Registration:

A. The Cost Control Team will confirm the written information and register, and organize it in the registration book. Proposals related to weight reduction are to be distributed to the Engineering Control Team.

B. The section which receives proposals from outside companies should write down the registration number on the upper right side of the theme/idea proposal sheet and take charge of the sheets.

(3)Study of contents:

The Cost Control Team and Engineering Control Team will study the contents of the proposals, achieve coordination with related sections, as necessary, and establish a list of items for study to be proposed at a design meeting.

(4) Proposition at design meeting:

The Cost Control Team and Engineering Control Team will compile a list of study items of themes/ideas, which are up for proposition at a design meeting, on a “DTC Trade Study Plan/Expediting List.” Items for design study will be adopted following discussions at a design meeting.

(5) Documenting each design team's study items:

Adopted items will be documented in each design team's WBS, following the procedure outlined on the related documents (1) and (2). A design meeting will examine the study. Items classified as DTC/LCC themes during a meeting will be placed under expedition control based on a “DTC Trade Study Plan/Expediting List”.

(6) Reporting to proponents:

The Cost Control Team and Engineering Control Team will report the design meeting's decisions and the progress of procedure in design study to proponents.

DTC-5 Fig. 1 DTC weight reduction theme/idea proposal sheet

Action → → → → →

DTC, Weight, R&M, Quality Theme/idea proposal sheet			Reg. No.			
Theme*	Company		Proposer Date			
WBS № Nomenclature or name	Phase to examin	Basic design	Plan drawing	Mfg. drawing	Review	Prod. Dwg.
		.	.			.

1. Theme (draft)/idea (Sketch as necessary)

2. What is the purpose or expected effect? *

3. What conditions must be satisfied to implement proposal?

4. What led you to create this proposal? *

Result of investigation and/or examination	Theme accepted
	Idea accepted
	Pending(up to)
	Not adopted
Note 1. No need to complete all columns. (*marked columns must be filled in) 2. Do not hesitate to propose something even if it is already being considered or has been proposed. 3. Proposal must be forwarded to ( ). 4. This proposal will be processed according to "DTC proposal andinvestigation/examination practice".	Follow-up
	. .
	. .
	. .

No.	Title	Approved by	Controlled by	Compiled by
DTC-10	Outline of DTC trade study (format to be used)			

1. Purpose:

To decide the procedure for selecting an optimum plan through a DTC trade study of multiple design plans

2. Related Documents

(1) DTC-4 "Procedure for DTC Theme/Idea Abstraction"
(2) DTC-5 "Procedure for DTC Weight Reduction Theme/Idea Proposal Sheet and management procedure"
(3) DTC-6 "Procedure for DTC Theme Selection"
(4) DTC-11 "Procedure for Making and Maintaining Cost Reduction Sheet
(5) DTC-12 "Procedure for Items not included Target Cost after DTC Study"

3. References

(1) Advanced Project Management Methodology;
"Thinking and its Procedure for DTCN and DTC" (ASII Publishing Co.)

4. Concerned Sections

Design, manufacturing planning, production, quality control (S&PA: Safety and Product Assurance), material, business administration, sales, DTC Secretary

5. Contents

(1) Procedure for making plans for comparison
(2) Estimate procedure
(3) Procedure for comparison for decision-making
Appendix 1: Procedure for filling DTC worksheet

6. Cycle of Operations by DTC Trade Worksheet

The operation cycle shown on Fig. 1 should be repeated before drawing, until the appropriate prospects are established.

7. Operation to Make Comparable Plans

(1) The Design Section will create more than two or three plans, which emphasize high effectiveness and efficiency in materializing design requirements, for comparison. Simplified design sketches and the characteristics of the design plans will be draw up in the DTC worksheet.
In order to create effective and efficient design plans for comparison, the FBS technique will be used.

(Note) 1. To create design plans, efforts should be made to create all possible minimum cost plans, minimum weight plans, maximum reliability and maintainability (R&M) plans and other extreme plans as shown in Fig. 1. A design plan should be made on the supposition that the right plan exists in an area surrounded by these three types of plans.

(Note) 2. When design plans have to be made, an "Idea matrix column " in the DTC worksheet should be used.

(Note) 3. In such cases, persons in charge of production technology, production, material, etc., will participate in the examination of the plans from the widest possible idea matrix.

(2) The Design Section documents those items necessary for making an estimate in an estimate worksheet (Estimate Price/Cost Breakdown Structure Table) and attaches it to a DTC trade worksheet. In those cases where Engineering information is necessary for estimating the cost differences of each plan, the information may not fit into a DTC worksheet alone.

8. Estimating

(1) The Design Section will make an estimate based on such factors as cost, weight, reliability and maintainability, etc., with the cooperation of related sections.

a. The DTC Secretary will make cost estimates with the support of the Manufacturing Planning and Material Sections.

b. If there are factors which should be appraised in the selection of a design plan besides cost, weight, reliability and maintainability, etc., (such as a Life Cycle List, or LCC), an estimate should also be made on them. (For the calculation of an LCC, a LCC estimate form should be used.)

c. If it is difficult to understand the difference between each plan in terms of reliability and maintainability, they may be appraised using the priority method.

(2) The Design Section will check for risks in the schedule, development, etc., of each design plan. If there are risks, they should be written down on the DTC worksheet.

9. Procedure for Comparison with the Decision-making Process

(1) Based on the estimate results, the Design Section will document the ranking of design plans in a space on the DTC trade worksheet and identify other data in a Weight/Cost Trade Study Graph to make a comparative appraisal. If a conclusion cannot be reached using a ranking of estimates, a weighing point appraisal method should be adopted to make a comparison.
(The weighing point appraisal method will be referred to in Chapter 4.3 of reference (1). "Evaluation and Structuring Method by Reasonable Feeling".

(2) The weighing-point appraisal method will be implemented as follows, using the appropriate space on the DTC worksheet.

a. First, factors for estimate appraisal and their weight coefficients in the weighted-point appraisal method are decided after obtaining the agreement of those people involved in plan selection.
b. Points are then set for each appraisal factor of the plan based on the ranking of estimated figures.
c. The points are multiplied using the weighing point appraisal method and each plan's total is calculated.
d. The ranking is decided by total points. If the ranking is questionable, a comprehensive adjustment is made with the agreement of the people concerned.

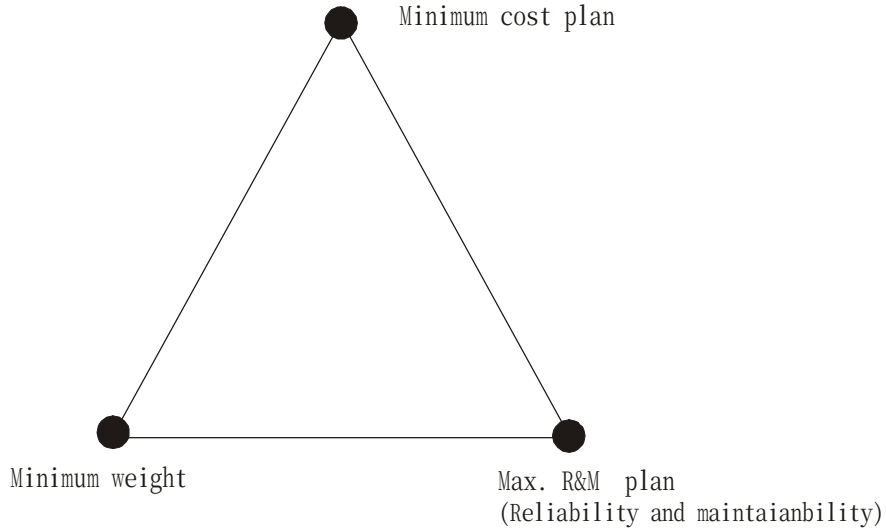
(3) The Chief of the Design Section will select a final plan for implementation through a comparative appraisal obtained using the above procedure. The Chief will write in a personal comment and outline the conditions for the selection in the appropriate spaces.

(4) The Design Section Chief will explain to the Chief Engineer and obtain approval from the Chief with the agreement of the DTC Secretary and Design Section Chief.
If necessary, agreement of the Manufacturing Planning and Material Section should be obtained.*

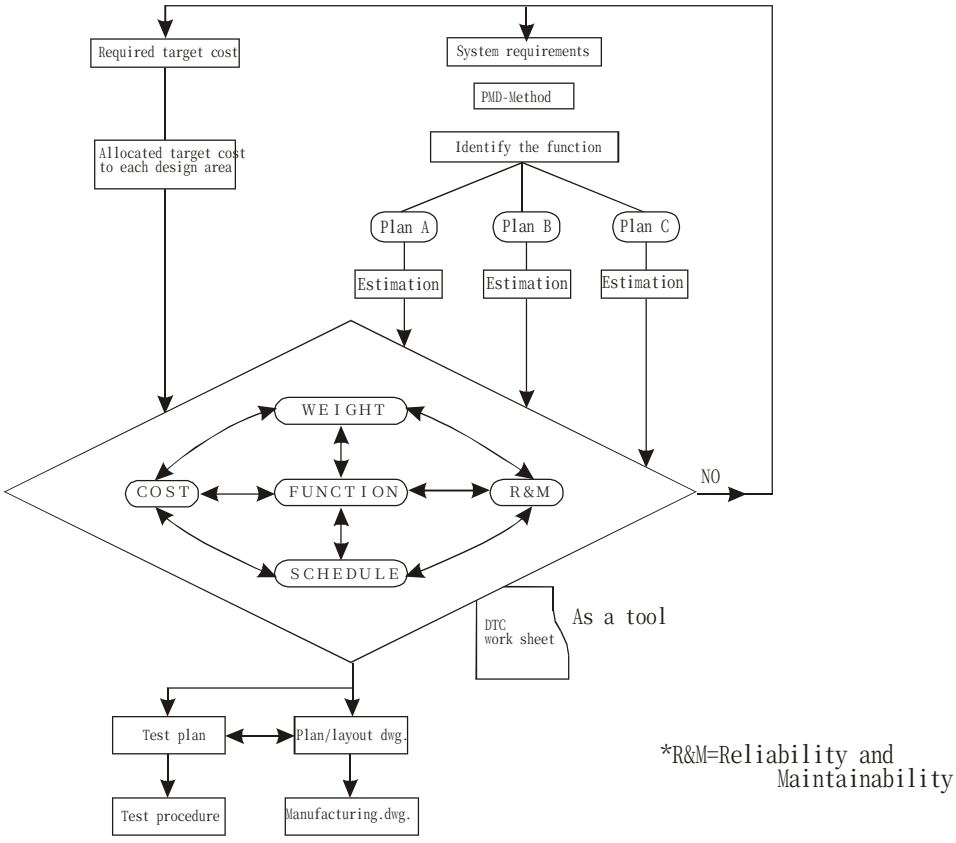
*For example, in selecting purchase equipment, the agreement of the Material Section becomes necessary.

Fig. 1 Creation of design idea and work cycle for Design-to-Cost

Most appropriate idea exists inside of triangle of three maximum feasible ideas or plans.

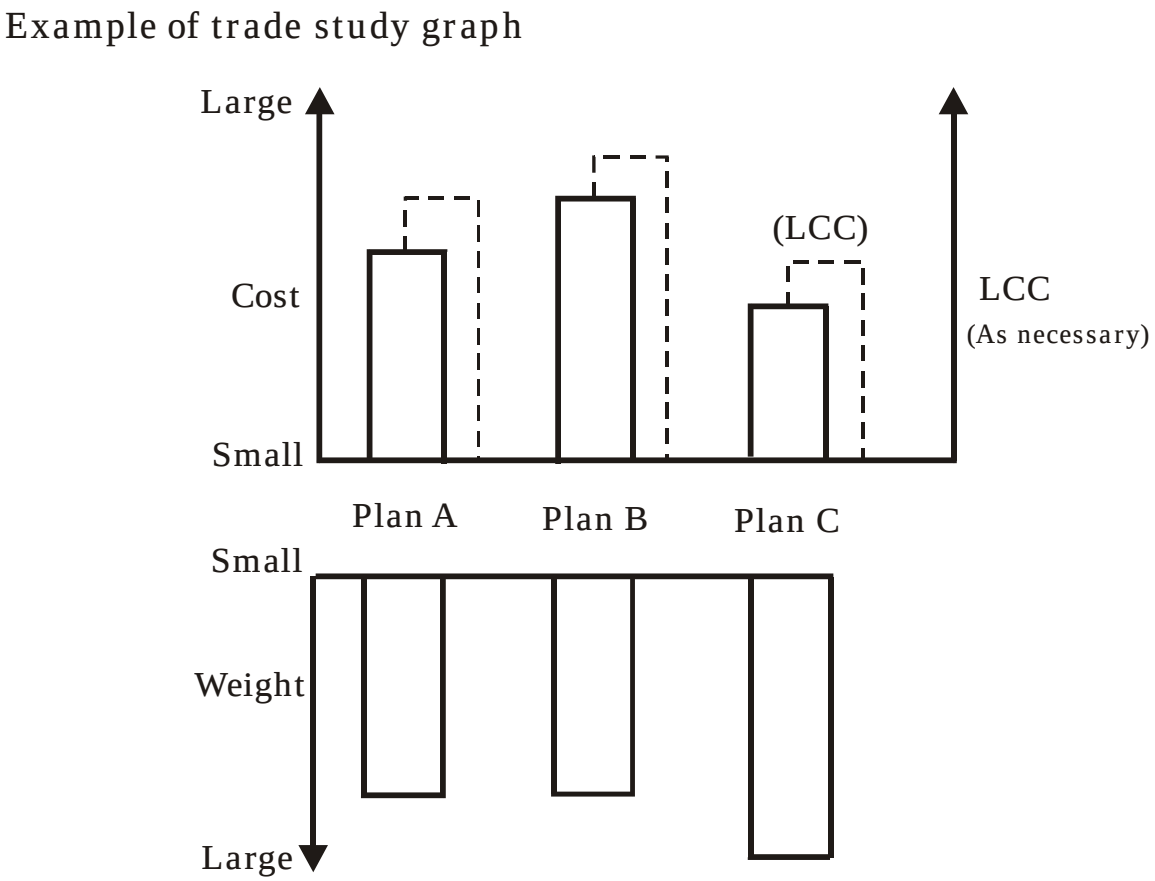


Design work cycle by DTC/LCC trade worksheet with ideas comparison



There is also a few case one idea creation flow design method .

Fig. 2 Example of trade study graph



DC-10 DTC Trade worksheet to be filled in

DTC worksheet

DTC WORK SHEET		R'qt Check	Basic Func.	Ideas creation	Ideas comparison	Evaluation	Judge	Agree: Leader	Agree: Cost Gp.	Agree: Chief	Approval: Planning	Approval: Purchasing	Person in charge ④	Revision	Drafted	Reviewed	Approved	Page
	Sch.Plan												Control No. ⑤					
	Act.Date																	

WBS Name ①	WBS No. ②	Theme ③	Basic Function ⑧

Target cost ⑥			Idea matrix: Type	Components	Materials	Mfg.ways	Sub-con etc.	Plan A Title ⑪	Plan B Title ⑪	Plan C Title ⑪	Sign column
Cost	Mfg.	M/H		⑨				(Sketch) ⑩	(Sketch) ⑩	(Sketch) ⑩	Drafted ⑫
	Material										Checked ⑫
	Total										Approved ⑫
Weight		Kg									
Reliability											Agreed
Maintainability											

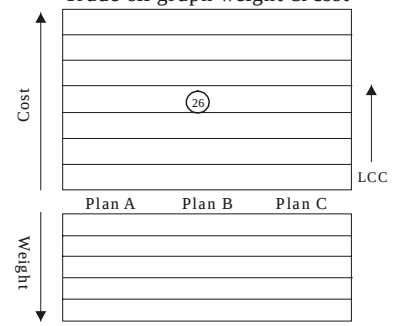
(Other Requirement) ⑦	Explanation of contents and its distinctive charactor

⑬ Notice on estimations
The estimated value of differences only is acceptable.

Cost Estimation (Average evaluation cost per XXX A/C)

	Plan A: Mfg.M/H (H)	Plan A: Material ⑭	Plan B: Mfg.M/H (H)	Plan B: Material ⑭	Plan C: Mfg.M/H (H)	Plan C: Material ⑭

Trade-off graph weight & cost



Eval.Item	Wt.Coef.	Plan A: Estimation	Plan A: Ranking	Plan A: Point	Plan A: Wt.*Point	Plan B: Estimation	Plan B: Ranking	Plan B: Point	Plan B: Wt.*Point	Plan C: Estimation	Plan C: Ranking	Plan C: Point	Plan C: Wt.*Point
Cost		⑮ $				$				$			
Weight	㉑	⑯ Kg	㉒	㉓	㉔	Kg				Kg			
		⑰											
		⑱											
		⑲											
		⑳											
Total			㉕										
Schedule & Comment		㉗											
Evaluation, Comment		㉘											
Total ranking		㉙											

Selected Idea ㉛	General comment & Conditions of selection ㉜	Sign	Chief Eng. ㊴	Sub-Chief ㊳	DTC suport ㊲

Drafted ㉚
Checked ㉝
Agreed ㉞ ㉟ ㊱

Appendix 1. How to fill in DTC worksheet

No.	Contents to be filled in	Person responsible
①	WBS name of trade study objective.(e.g. wing box)	Designer
②	WBS No. of above	Designer
③	Theme of trade study. (e.g., breakdown style of fuselage and wing)	Designer
④	Design group name	Designer
⑤	Worksheet control No.（List this number in registration list controlled by Cost Control Group) Example : ＤＴＣＸ－４－００１ Company Initial Group No. Serial No. in group	Designer
⑥	Write target cost (If not applicable, leave it blank.)	Designer
⑦	Design requirements and caution (If not applicable, leave it blank.)	Designer
⑧	１. Write the keyword of the basic function when necessary. In order to identify the keyword of the basic function, use the PMD method. ２. Do not write this when selecting equipment.	Designer
⑨	１. Write the possible ideas to satisfy the basic function. ２. Use NM-Method when having difficulty coming up with ideas or expanding the scope of the idea. See NM-Method in Appendix A.	Designer
⑩	１. Draw sketches of the maximum feasible and comparative	Designer

	designs using elements in row ⑨. 2. Make an effort to draw two or more possible comparative plans even though only one plan can be considered. 3. It is recommended that the comparative plan include: minimum cost plan, minimum resource plan, and optimized plan. 4. The comparative plan must show the necessary information and data, if only in rough. 5. Show the comparative characteristics of the comparative plans.	
⑪	After finishing ⑩, give the characteristics of each plan a name that is easy to understand.	Designer
⑫	Have creater, checker and group leader sign/initial the worksheet.	Designer
⑬	Conditions of estimating.	Designer
⑭	Manufacturing, material and amortizing costs for each idea or plan. (It is acceptable to show only the difference in estimated cost of the comparative plans.)	Cost Control Group (Teamed with manuf. Plan & purch. grp.)
⑮	Total estimated cost to compare. (〃)	As in ⑭
⑯	Estimated weight to compare. (〃)	Designer
⑰	Write numerical parameter of reliability. (If necessary) e.g.; MTBF (Mean Time Between Failure) If it is difficult to estimate this numerical value, it is acceptable to use the result of comparison by the priority method.	Designer
⑱	Write the numerical parameter of maintainability. (If necessary) e.g.; MTTR (Mean Time To Repair). If it is difficult to estimate, it is acceptable to use the result of comparison by the priority method.	Designer
⑲	Fill in this column if there is a necessary comparative factor which greately affects decisions other than cost, or R&M. e.g.; LCC, performance, deployment.	Designer

⑳	The numerical estimate of column ⑲ . If it is difficult to estimate this numerically, do not use the priority method.	Designer
㉑	Compare the comparative plans using estimated value and then prioritize each plan. If it is easy to get the result by priority method, it is not necessary to fill in columns ㉑ ～ ㉔ for the weighting factor method.	Designer
㉒	Fill in the evaluation number of the comparative plan for each evaluation factor.	Designer
㉓	Fill in the weighting number for each evaluation factor.	Designer
㉔	Fill in the result of ㉒ × ㉓ of each plan.	Designer
㉕	Total the priority numbers or numerical results of the weighted evaluation.	Designer
㉖	Visualize the comparison using a bar graph of the estimated values of each plan. When an LCC (lifecycle cost) comparison is made, show an LCC estimate bar graph. (See Fig. 2 for an example of a comparison bar graph)	Designer
㉗	Write the schedule risk, development risk or problem as necessary.	Designer
㉘	Write a comment about each plan.	Designer
㉙	Fill in the total priority number of integrally compared results.	Designer
㉚	Have designer and checker sign or initial.	Designer

㉛ Write the pre-selected plan as a draft of the final selection.