



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**The Implementation of Risk Management at Aerospace
Manufacturing Company**

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Manufacturing Engineering (Manufacturing Management) with Honours.

by

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THE IMPLEMENTATION OF RISK MANAGEMENT AT
AEROSPACE MANUFACTURING COMPANY

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APPROVAL

This report is submitted to the Faculty of Manufacturing Engineering of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Manufacturing Engineering (*Manufacturing Management*). The members of the supervisory committee are as follow:

(En Effendi bin Mohamad)

ABSTRACT

This report presents the study of risk management implementation in an aerospace manufacturing company. The process of risk management is performed in CTRM AC (Composites Technology Research Malaysia – Aero Composites) Sdn Bhd, Batu Berendam, Melaka. The company has decided to implement risk management so that the mission and vision of the company are not affected by the potential risks. The objectives are to study the nature of risk management, develop a structure of risk management process, and to measure the effectiveness of the implementation at the selected company. This report focuses on the process of managing operational risks of the company by adopting the AS/NZS 4360:2004 Risk Management Standards as reference. The methods training, brainstorming, checklist, survey and questionnaires, and risk score matrix are used during the study. These methods are determined from literature review. A structure of risk management process is developed from the methodology mentioned earlier. The structure is implemented at Strategic Development Department (SDD) and Paintshop Department (PD) as a pilot study. The structure consists of risk assessment which is risks identification, risks analysis, risks evaluation, and risks treatment. The effectiveness of the implementation is measured by how many basic requirements are fulfilled. It is also measured by determining which components is improved and significantly changed due to the implementation.

ABSTRAK

Laporan ini merujuk kepada pelaksanaan pengurusan risiko di sebuah syarikat pembuatan aeroangkasa. Syarikat yang terlibat dalam kajian ini ialah CTRM AC (Composites Technology Research Malaysia – Aero Composites) Sdn Bhd, yang terletak di Batu Berendam, Melaka. Langkah untuk melaksanakan pengurusan risiko ini diambil supaya visi dan misi syarikat tidak terganggu disebabkan oleh risiko-risiko yang bakal berlaku dalam pengoperasian. Objektif kajian ini ialah untuk memahami konsep pengurusan risiko, merangka struktur yang sesuai untuk proses pengurusan risiko, dan mengukur tahap keberkesanan pelaksanaan proses terbabit di syarikat yang terlibat. Laporan ini tertumpu kepada proses untuk menguruskan risiko operasi syarikat dengan menggunakan AS/NZS 4360:2004 Risk Management Standards sebagai rujukan. Kaedah seperti sesi latihan, tinjauan dan senarai soalan, senarai semakan dan matriks skor risiko digunakan dalam kajian ini. Kaedah-kaedah tersebut didapati hasil dari kajian ilmiah yang dilakukan sebelumnya. Struktur proses pula dibentuk berdasarkan kepada kaedah-kaedah yang dinyatakan tadi. Struktur ini telah digunapakai di Strategic Development Department (SDD) and Paintshop Department (PD) sebagai kajian penentu. Struktur tersebut terdiri dari proses mengenalpasti, menganalisa, menilai, dan mengawal risiko-risiko. Tahap keberkesanan pelaksanaan ini dinilai dengan mengukur sebanyak mana keperluan asas yang telah dipenuhi. Ia juga turut dinilai berdasarkan kepada komponen-komponen yang dipercayai mampu mengalami peningkatan dan mengalami perubahan memberangsangkan hasil dari pelaksanaan tersebut.

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

AS/NZS	-	Australian/New Zealand Standards
BAE	-	British Aerospace
BOT	-	Built-Operate-Transfer
CASA	-	Construcciones Aeronáuticas
CTRM	-	Composites Technology Research Malaysia
CTRM AC	-	CTRM Aero Composites
CTRM AV	-	CTRM Aviation
CTRM CE	-	CTRM Composites Engineering
EADS	-	European Aeronautic Defense and Space
FMEA	-	Failure Modes and Effects Analysis
GKN	-	Guest, Keen and Nettlefolds
HR	-	Human Resource
IPT	-	Integrated Product Team
IRMA	-	Integrated Risk Management Application
KARI	-	Korea Aerospace Research Institute
KPI	-	Key Performance Indicator
KSLV-I	-	Korea Space Launch Vehicle-I
MRO	-	Maintenance Repair Overhaul
NASA	-	National Aeronautics and Space Administration
PD	-	Paintshop Department
PSM	-	Projek Sarjana Muda
SDD	-	Strategic Development Department
SOP	-	Standard of Procedure
SEIT	-	Systems Engineering Integration and Test
SWOT	-	Strength, Weakness, Opportunities, Threats
UK	-	United Kingdom
WBS	-	Work Breakdown Structure

CHAPTER 1

INTRODUCTION

This chapter is the introductory section of the report. It contains the background, problem statement, objectives, and scope of the study. The significance of the study and the research methodology is also stated in this chapter.

1.1 Background of the Study

This study is about the implementation of risk management at aerospace manufacturing company. Looking back to the title, it mostly refers on how to implement risk management process and where to implement it. Many knew that risk management has been practiced widely in banking and financial area, but for this study it is more on managing the risks in aerospace company. Hence, this study is a pioneer for aerospace manufacturing industry in Malaysia.

1.1.1 Risk Management

Risk is something that happens without any notice. Risk is also involved with uncertainty especially when one is doing something new – for example a project. Risk can be controlled, reduced, retained, and even transferred to another party. It is not all about negative when discussing about risk. There are some risk that could lead to opportunities and benefits. A risk has a cause and if it occurs, there will be consequences. By implementing risk management, an organization is prepared to expect the unexpected during the whole project or process.

Cooper *et al.* (2005) states that risk management is a culture, processes, and structures that are directed towards the effective management of potential opportunities and adverse effects. It is a holistic (wholly, thoroughly) management process which is applicable in all kinds of organizations at all levels and to all individuals.

An organization has the chance to improve their planning, performance, and effectiveness when practicing risk management. According to Anonymous (2004) in the Risk Management Guidelines to AS/NZS 4360, an organization could expect fewer surprises, build up the economy and efficiency and also enhance their company reputation and credibility. There are much more benefits to be gained especially when it involves with financial, safety and health, operations and information systems. As mentioned before, risk is an exposure to the effects of uncertainty and that is why risks have to be managed in order to control the possibility of loss or gain.

The implementation requires planning and methods. There are seven elements involved with the risk management process. They are establishing the context, identifying the risks, analyzing the risks, evaluating the risks, treating the risks, communicating and consulting, and lastly monitoring and reviewing.

To effectively perform those seven elements, there are numerous techniques provided. There are brainstorming, WBS (Work Breakdown Structure) analysis, SWOT (Strength, Weakness, Opportunities, Threats) analysis, survey, questionnaires, risk analysis, checklist, etc. Some of company which implements risk management develops a system of risk management in order to save time and energy for record and revision of risks data.

A successful risk management requires a culture in which threats are embraced not denied and problems are identified not hidden (Gray and Larson, 2008). The statement clarifies the importance of communicating and consulting, and monitoring and reviewing. Both elements are concurrently performed. Thus, not only a stakeholder is in charge but every person involves in project or process should play

their own responsibilities when managing risk as if it is one of their job's specifications.

The risk management process can be applied in all organizations, and at all levels in an organization – organization, department, team, and individual level (Anonymous, 2004). It also can be applied to an activity or function. Basically, the risk management process should be applied when planning and making decisions about significant issues such as considering changes in policy, managing projects, or introducing new strategies and procedures. Moreover, risk management has a range of applications including environmental issue, health and safety, asset management and resource planning, project management, etc.

1.1.2 Relationship of Project Management and Risk Management

Projects, by its nature, are unique and complex. They are usually performed within an extended period of time and demand with the engagement of a wide range of resources which include people, finance, facilities, materials, and intellectual property (Cooper *et al.*, 2005). Basically, a project should have defined objectives or an end-state that provides those involved in the project with a clear vision and specification of their goal.

The purpose of implementing risk management in a project management is to minimize the risks of not achieving the objectives of the project and the stakeholders with an interest in it. Furthermore, it is also for identifying and taking chances in every opportunity. Generally, risk management assists project managers in setting priorities, allocating resources and implementing actions and processes that reduce the risk of the project not achieving its objectives (Cooper *et al.*, 2005).

Whether it is realized or not, risk management is something that many project managers have been doing whether it is scenario planning for project appraisal, negotiating contract conditions or developing emergency or possibility plans. Although many project managers do not use the term 'risk' when doing these

activities, the concept of risk is central to what they are doing. Better management of risk and more successful activities are the outcomes.

The success of projects is related with a systematic identification, analysis and assessment of risk and way of dealing with the results. However, poorly managed project risks may have large negative implications for the achievement of organizational objectives. It should be reminded that a risk may also give positive consequences. As explained by Cooper *et al.* (2005) in his book, risk should be considered at the earliest stages of project planning, and risk management activities should be continued throughout a project. Risk management plans and activities should be an integral part of an organization's management process.

1.2 Problem Statement

CTRM AC Sdn Bhd has decided to implement risk management process to manage its operational risks. The purpose is to ensure that all the risks (process, system, people, external events, and financial risk) are managed effectively so that the company mission and vision are not affected and all company KPIs (Quality, Cost, Delivery, Accountability, and Continuous Improvement) are achieved.

1.3 Objectives of the Study

The objectives of this study are:

- 1.3.1 To study about risk management.
- 1.3.2 To develop a structure of risk management at selected company.
- 1.3.3 To measure the effectiveness of the implementation of risk management at selected company.

1.4 Scope of the Study

The study will focus primarily on the process of managing risks in CTRM AC Sdn Bhd especially in Strategic Development Department (SDD) and Paintshop Department (PD). The development of the process structure is customized from the AS/NZS 4360 approach. Methods of training, brainstorming, checklist, survey and questionnaires, and risk score matrix is used to determine the results. These methods are initially obtained from literature review that has been conducted in the early stage of the study.

Other types of risk management approaches and risks such as financial and business risks will not be discussed in this report.

1.5 Significance of the Study

The study shows the importance of implementing risk management process in an organization. It defines the process of managing operational risks, the development of the structures, and the effectiveness of the implementation.

The case study of CTRM AC Sdn Bhd simply shows how the operational risks are managed in the company. In addition, the study is used as preliminary reference for future work of risk management implementation.

1.6 Research Methodology

The risk management is a process of communicating, identifying, analyzing, evaluating, treating, monitoring and reviewing the risks. There are tools and techniques performed for every process which are training, brainstorming, checklist, survey and questionnaires, and risk score matrix. Further explanation of the methodology can be reviewed in Chapter 3.

1.7 Organization of the Report

This report is organized in six chapters. Chapter 1, the introduction of this report, describes the background of the study. The problem statement, objectives, and scope of the study are presented in this chapter. In addition, the significance and the methodology of the study are also clarified. Chapter 2 consists of literature review of the study. The chapter covered the theory of risk management and some useful information that relates with the study. Chapter 3 describes the methodology used to obtain the expected result in the study.

Chapter 4 explains about the company profile. Chapter 5 defines the results and data analysis from the conducted study. The discussion of the results is explained further in this chapter. Chapter 6, the final chapter of this report, concludes the findings of the study. The suggestions and recommendations for future work are also presented in this chapter.

1.8 Gantt Chart

The Gantt chart is used to display the project planning and scheduling. This chart consists of the activities planned in one year duration of the study. The chart can be reviewed in Appendix A.

CHAPTER 2

LITERATURE REVIEW

Some researches were made in order to gain knowledge risk management and how it is performed in other company. The research covers theory of implementation and some useful information that relates with the study. All the reviews were found from articles, journals, and reference books. Collecting data from many resources is excellent way to understand the theories and the applications.

2.1 Introduction

A case study is developed through a reference of different sources. Several questions were built which relates to the requirements of the study. The answers are used to create better understanding about the study. The list of questions is as follows:

- 2.1.1 What is risk management?
- 2.1.2 Why risk management is important?
- 2.1.3 Who has implemented risk management?
- 2.1.4 How do they implement risk management?
- 2.1.5 What are the basic requirements for an effective risk management?
- 2.1.6 Where does risk management applies?

2.2 Case Study 1: Risk Management Overview

One of the objectives to accomplish the study is to understand the background of risk management. According to Anonymous (2004), and Cooper *et al.* (2005), risk

management refers to the culture, processes, and structures that are directed towards the effective management of potential opportunities and undesirable effects. A systematic application of management policies, processes, and procedures is involved to the tasks of establishing the context, identifying, analyzing, assessing, treating, monitoring, and communicating risks.

Risk management also referred as a continuous and iterative process which performed to reduce the probability of adverse threats, in other words, increase the probability of successfully completing the project (Perera and Holsomback, 2004). While according to Yoo *et al.* (2006), it is said to be an organized method for identifying and measuring risk and for selecting, developing, and implementing options for the handling of risk.

There is also a definition of risk management within a project environment scope. It is defined as the systematic process of identifying, analyzing, and responding to uncertainty as project-related events or conditions which are not definitely known which have the potential of adverse consequences on a project objectives (Project Management Institute as cited in Zafra-Cabeza *et al.*, 2007).

2.3 Case Study 2: Benefits of Risk Management

This case study determines the significance of managing risks which took place in a project or organization. Risk management is an integral part of project management and contributes directly towards the mission and objectives of the project (Durham and Itchkawich, 2004; Yoo *et al.*, 2006).

Risk management approach helps in developing the process structure and many potential risks can be identified through risk assessment. Risk management process provides a culture of proactive decision making in order to assess continuously what could go wrong, determine which risks are important to deal with, and implement strategies to deal with those risks (Shtub *et al.*, as cited in Sinha *et al.*, 2004).

Perera and Holsomback (2004) define the benefits of documenting the risk management process. It is said that a consistent documentation and assessment provides a means of archiving lessons for future identification or mitigation activities. Besides, information about schedule, cost, technical and safety issues can be tracked through proper documenting system.

Different angle of benefits are obtained from the BOT (built-operate-transfer) project. This project, also known as privatization scheme, is one of the most risky project schemes. A risk management process is very important because the analysis works effectively in the negotiation with government. The project company must be able to demonstrate how risk is anticipated and how risk is included in its bid price (Dey and Ogunlana, 2004). It helps the government to select the possible supplier to work in the project.

In the scope of project management, the benefits of risk management are very broad. It is used to identify potential risks so the threats can be minimized and the opportunities are taken into advantage. Cooper *et al.* (2005) states that managing risks will assists in setting priorities, allocating resources, and implementing actions and processes that could reduce the risks. Risk management provides insight, knowledge, and confidence for better decision making.

Zafra-Cabeza *et al.* (2007) classifies several advantages of performing risk management. Some of the advantages are reducing the risk impact that may affect the system, identifying a number of potential risks during the project, and forecasting final duration of a project and its cost estimate at completion by a method based on risks.

2.4 Case Study 3: Basic Requirements for Effective Risk Management

There are a few basic requirements to be considered for an effective risk management implementation. An adequate risk assessment technique should be applied based on the company structure and culture. The management might want to

ensure that the applied risk assessment techniques are within the stated goal of the company (Sinha *et al.*, 2004).

Another important requirement is to form an appropriate risk management organization and assign applicable responsibilities and roles to the organization members (Perera and Holsomback, 2004; Yoo *et al.*, 2006). This could avoid the cross-functional and cross-program implications during risk decision-making. Lastly, the process of risk management should provide an opinion based document to better discuss the cause of action selected (Perera and Holsomback, 2004).

2.5 Case Study 4: Application of Risk Management

This case study reviews in which fields does risk management applies. According to Cooper *et al.* (2005), risk management process applies across all project phases, and projects that arise at all phases of the asset life cycle. The statement explains the importance of implementing risk management into all levels of organizations whether departments, groups, processes, or events.

Furthermore, the application of risk management is not constraint for project environment only. The range of application is rather unlimited. For example, it can be applied in purchase and contract management, health and safety, compliance, feasibility studies, resource allocation and many others. In fact, it is also applied in the daily routines.

2.6 Case Study 5: Implementation of Risk Management Process

This case study shows two examples from two different organizations which implements the risk management process. They are Korea Aerospace Research Institute (KARI) and NASA (National Aeronautics and Space Administration).