Flying Car Project Charter

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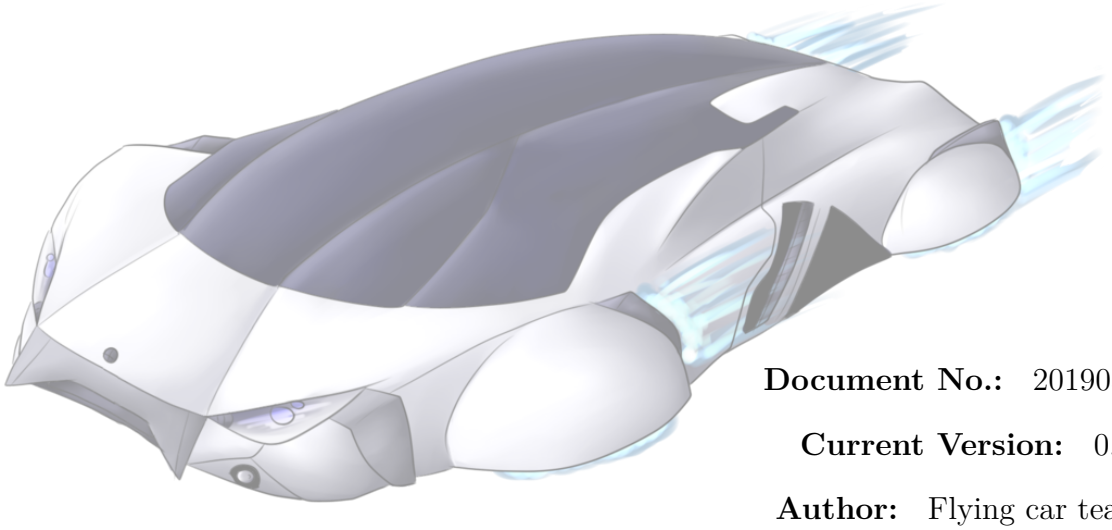

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Document modification control

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Contents

Chapter 1

Introduction of Projrct Charter

§ 1.1 Overview

As a pioneer in the automobile-aviation industry, in order to promote the development of this industry, make the airplane commonplace, perpetuate the company and strengthen the public image and its position in the current markets, Ethane Autoplane Co., Ltd. decided to launch this project of Flying Car.

This project charter, as a multi-agreement document, will include definition of project objectives, development of implementation strategies, validation of project components and responsibilities and planning of project work. In order to ensure that the project implementation achieves the desired goals, the signing of the document will give the company implementation team authority and responsibility to carry out the work.

§ 1.2 Background

Flying car is a personal vehicle that is capable of door-to-door aerial transport conceptually without the need of special take-off and landing as is required in an aircraft while also providing the comfort of a roadable car. Flying car would be used for shorter distances, at higher frequency, and at lower speeds and lower altitudes than conventional passenger aircraft. Though the concept seems to be a workable one but bringing it on the commercial front has been very challenging task and a surprising number of companies have been working to bring up an acceptable model. Many prototypes have been built since the first years of the twentieth century using a variety of flight technologies, but no flying car has yet reached production status.

The mechanical challenges of flying car are so strict that every opportunity must be taken to keep a minimum weight but at the same time a typical lightweight airframe is easily damaged. On the other hand, a road vehicle must be able to withstand significant impact loads from casual incidents as well as low-speed and high-speed impacts, and the

high strength demands can add considerable weight. Thus, a practical flying car must be both strong enough to pass road safety standards and light enough to fly.

Since the flying car would be used at lower speeds and lower altitudes than conventional passenger aircraft, and the optimal fuel efficiency for airplanes is obtained at high altitudes and high subsonic speeds, the flying car's energy efficiency would be lower compared to a conventional aircraft. Similarly, the flying car's road performance would be compromised by the requirements of flight, so it would be less economical than a conventional motor car as well. Our goal is to strike a balance between the two and maximize the benefits.

§ 1.3 Objective

A mass-produced affordable and practical airplane product would be made, marketed, sold, and maintained just like an automobile. And our flying car must be capable of safe, reliable and environmentally-friendly operation both on public roads and in the air. For widespread adoption it must also be able to fly without a qualified pilot at the controls and come at affordable purchase and running costs. We initially plan to complete all conceptual model designs by 2025 and achieve industrial production by 2030. And the pre-orders should be held before the industrial production undergoes. The acceptance of delivery is ought to be finished by the year 2035.

§ 1.3.1 Safety

A major problem, which increases rapidly with wider adoption, is the risk of mid-air collisions. Another is the unscheduled or emergency landing of a flying car on an unprepared location, including the possibility of accident debris. In mid-air collisions and mechanical failures, the aircraft could fall from the sky or go through an emergency landing, resulting in deaths and property damage. In addition, poor weather conditions, such as low air density, lightning storms and heavy rain, snow or fog could be challenging and affect the aircraft's aerodynamics.

§ 1.3.2 Reliability

A basic flying car requires the person at the controls to be both a qualified road driver and aircraft pilot. This is impractical for the majority of people and so wider adoption will require computer systems to de-skill piloting. These include aircraft maneuvering, navigation and emergency procedures, all in potentially crowded airspace. Fly-by-wire computers can also make up for many deficiencies in flight dynamics, such as stability. A practical flying car may need to be a fully autonomous vehicle in which people are present only as passengers.

§ 1.3.3 Environmentally-friendly

A flying car capable of widespread use must operate safely within a heavily populated urban environment. As people's awareness of environmental protection gradually increases, when the products are marked with "green labels", it will further promote the company's development in the market. Therefore, the lift and propulsion systems must be quiet, have safety shrouds around all moving parts such as rotors, and must not create excessive pollution. Green energy sources such as solar energy, wind energy and other clean energy sources should also be considered if conditions permit.

§ 1.4 Cost

Since the Skyrunner' s first flight-capable personal vehicle is now available (but has not yet achieved mass production) on sale price of 119 thousand dollars. In order to attract customers, popularize our products and strengthen the company's position in the market, our initial pricing for the product is 100 thousand dollars. Therefore, maximizing the company's interests requires controlling costs at every stage.

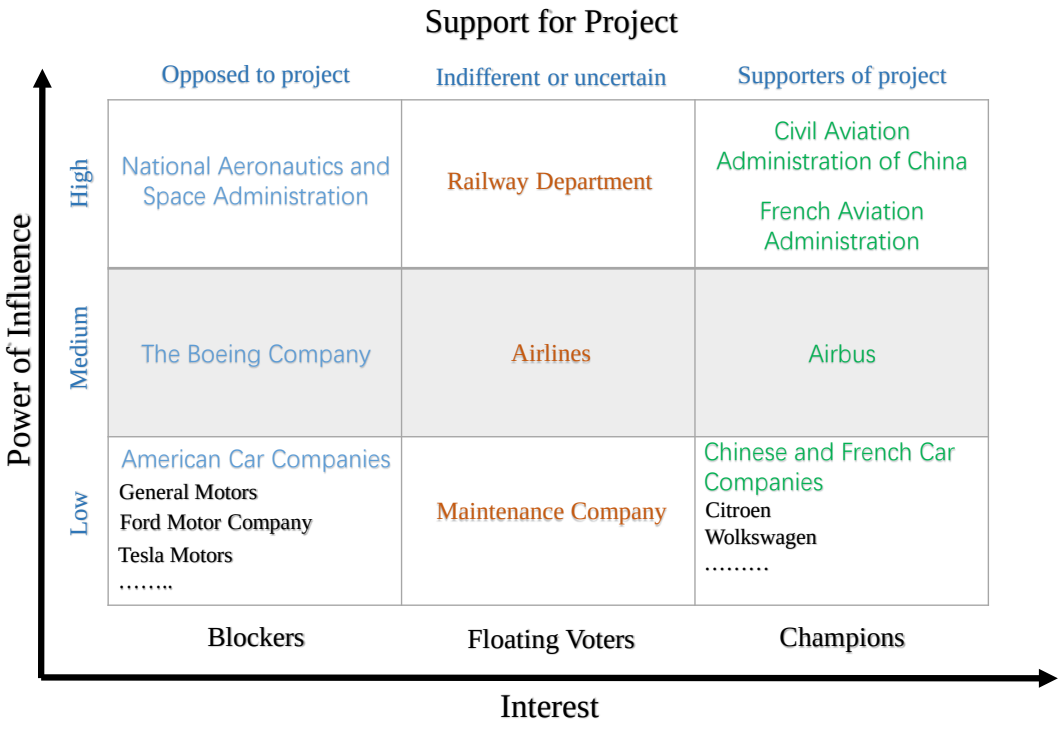
The design and determination of the concept model is crucial, and it will be carried out by a professional research team in using numerical simulation technology, which would cost within 10 million dollars. The adoption of new structural materials, the development of automated driving and the need for the propulsion system to be both small and powerful can at present only be met using advanced and expensive technologies. The cost of manufacture could therefore be as much as 100 million dollars. In the delivery stage, the cost of trial flight, airworthiness license, maintenance training and so on should controlled within 80million dollars. For product promotion and sales, the cost should be controlled within 1 million dollars.

Chapter 2

Project Scope

§ 2.1 Stakeholders

Terrafugia, AeroMobil, PAL-V One, Moller International, Zee.Aero and Urban Aeronautics are among the few well-known names in this regard who are trying to make future Flying Cars real one day. Volkswagen, Toyota are the established mobile companies that have also been working on the concept of Flying Car. Besides, there are others like NASA, US military backed organisations and the Boeing company that are working on to bring up a flying car that can serve civilian as well rescue operations needs. The following picture is the stakeholder mapping.



§ 2.1.1 Project sponsor

Civil Aviation Administration of China, the aviation authority under the Ministry of Transport of the People's Republic of China is the sponsor of this project, who aims at improving the whole situation of Chinese aviation and transportation.. It oversees civil aviation and investigates aviation accidents and incidents. As the aviation authority responsible for China, it concludes civil aviation agreements with other aviation authorities, including those of the Special administrative regions of China which are categorized as "special domestic".

§ 2.1.2 Project team members

Companies Terrafugia, AeroMobil, PAL-V One and Zee.Aero are considered to be the major components of the project team along with the companies Citroen, Volkswagen and Airbus who provide the technical support aviatic and terrestrial.

1. **Terrafugia**

   Terrafugia, founded by MIT Grads is a company that is expected to launch the Transition Model after testing to check meeting standards for air and road safety underlined by Federal Aviation Regulatory body.

   The company has already intended to receive about 100 pre-orders on Transition mode after announcing launch in upcoming years. Besides the next generation model Terrafugia TF-X would also be developed with increased automation and scheduled for commercial availability after ten years post its debut in 2019 if it undergoes all tests successfully.

2. **Aeromobil**

   Aeromobil, a company has come up with an upgraded prototype of flying car AeroMobil 3.0. After an initial test crash, AeroMobil 3.0 finally made a successful maiden flight in the last decade. The CEO Juraj Vaculik had suggested the company' s plans to launch the model commercially. The importance of meeting regulatory standards for a flying vehicle cannot be understated and thus it would not be surprising if there occurs further delay by a couple of years before the final launch. Besides, AeroMobil also plans to make a fully automated version of the prototype for increased safety and comfort standards.

3. **PALV**

   PALV is a company from Netherlands that has developed a Personal Air And Land Vehicle Prototype PAL-V One that it claims can give experience of driving a sports car on road and at the same time like a flying bird in the sky giving a dimension of freedom by taking off from one island and landing to another, flying over mountain ranges and rivers.

4. **Aero**

   Aero, a small company inZhongguancun Science and Technology Park is working on to flying car concept to build up a VTOL machine. A patent filed by the company states that the VTOL car is capable of getting parked in a shopping mall. The project lead Ilan Kroo, an aeronautics professor and NASA scientist. The Aero has been designed in an arrangement that is called as 'Canard wing' wherein the payload area lies between front and rear set of wings.

§ 2.1.3 Project customer

The customer will originally be someone or some companies who have an interest or a gain upon a successful completion of the project. We will divide them into three parts.

First, several airlines such as China Southern Airlines and Air China. As the economic roars, the plane has sneaked into every inch of our transportation, this new concept "flying car" is possibly to lead a trend of new convenient method of transportation. Therefore the airlines may consider it as another type of aircraft. Furthermore , we could named it Boeing 797.

Second, as the flying car may serve as a powerful alternative and prioritized option of car in the future, by which the vehicles like private cars are potential to be replaced. Looking at the future development, the car companies such as BMW group and Toyota Motor Corporation are also supposed to renew their products, they launch am annual release of a new system, attend the annual conference and conduct academic research. Supposing that the flying cars will be gradually accepted by the public, it is high time for them to introduce this new product.

What' s more, the flying cars could attract individuals who are obsessed with cars or planes. The flying car is exactly a consummate combination which not only offers countless opportunities to maximize efficiency, but also spice up the journey on the road.

§ 2.2 Technology

§ 2.2.1 Modeling

In terms of the model of the flying car, the project will select the most compatible one among several models created by the software CATIA. The main function and part are same, however, we are about to simplify the model into an optimization problem and find the best. Optimization problems are often multi-modal; that is, they possess multiple good solutions. They could all be globally good (same cost function value) or there could be a mix of globally good and locally good solutions. Obtaining all (or at least some of) the multiple solutions is the goal of a multi-modal optimizer.

Classical optimization techniques due to their iterative approach do not perform satisfactorily when they are used to obtain multiple solutions, since it is not guaranteed

that different solutions will be obtained even with different starting points in multiple runs of the algorithm. Evolutionary algorithms, however, are a very popular approach to obtain multiple solutions in a multi-modal optimization task.

§ 2.2.2 Engine

Ion engine will be the major component that generate the flying car. Ion thrusters use beams of ions (electrically charged atoms or molecules) to create thrust in accordance with momentum conservation. The method of accelerating the ions varies, but all designs take advantage of the charge/mass ratio of the ions. This ratio means that relatively small potential differences can create high exhaust velocities. This reduces the amount of reaction mass or propellant required, but increases the amount of specific power required compared to chemical rockets. Ion thrusters are therefore able to achieve high specific impulses. The drawback of the low thrust is low acceleration because the mass of the electric power unit directly correlates with the amount of power. This low thrust makes ion thrusters unsuited for launching spacecraft into orbit, but effective for in-space propulsion.

They are categorized as either electrostatic or electromagnetic. The main difference is the method for accelerating the ions. Electrostatic ion thrusters use the Coulomb force and accelerate the ions in the direction of the electric field. Electromagnetic ion thrusters use the Lorentz force to move the ions. Therefore, this problem should also be solved.

§ 2.2.3 Material

The composite materials and the alloy will compose the main materials of the flying cars, especially the composite material like Fibre-reinforced polymers(FPR).

FRP include carbon-fibre-reinforced polymer(CFRP) and glass-reinforced plastic(GRP). If classified by matrix then there are thermoplastic composites, short fibre thermoplastics, long fibre thermoplastics or long fibre-reinforced thermoplastics. There are numerous thermoset composites, including paper composite panels. Many advanced thermoset polymer matrix systems usually incorporate aramid fibre and carbon fibre in an epoxy resin matrix.

§ 2.2.4 Flight control system

A conventional fixed-wing aircraft flight control system consists of flight control surfaces, the respective cockpit controls, connecting linkages, and the necessary operating mechanisms to control an aircraft's direction in flight. Aircraft engine controls are also considered as flight controls as they change speed.

The fundamentals of aircraft controls are explained in flight dynamics. This article centers on the operating mechanisms of the flight controls. Our flight control system are determined to imitate the technology of Airbus, and will be gradually transformed to an unmanned aerial vehicle(UAV), commonly known as a drone.

§ 2.2.5 Test-analysis

The simulation of the flying car will use the method of Verification and Validation(V&V).

Verification is the process of determining that a model implementation accurately represents the developer' s conceptual description of the model and the solution to the model.

Validation is the process of determining the degree to which a model is an accurate representation of the real world from the perspective of the intended uses of the model.

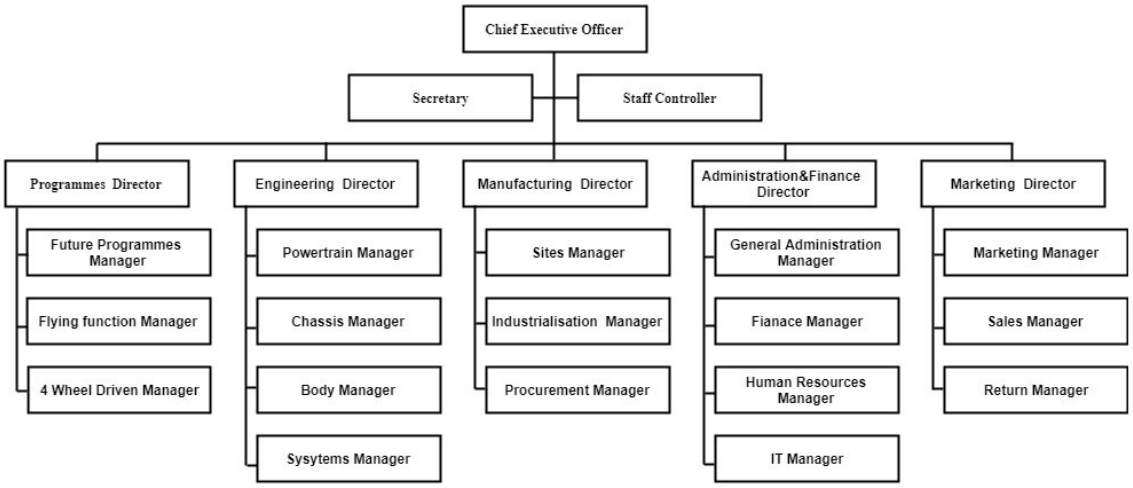
Verification and validation are processes that collect evidence of a model' s correctness or accuracy for a specific scenario; thus, V&V cannot prove that a model is correct and accurate for all possible conditions and applications, but, rather, it can provide evidence that a model is sufficiently accurate. Therefore, the V&V process is completed when sufficiency is reached.

Chapter 3

Project Organizational Structure

§ 3.1 Project organizational chart

The Flying Vehicle Design and Production project team consists of a project steering committee, a customer service team, a project manager, a functional team, and a technical team. The project was initiated by the Project Steering Committee, which is also the main decision maker and strategy maker for the project. All project matters are coordinated and managed by the project team. The project team will consist of full-time project managers, technicians, and business owners and experts in key functional areas.In addition, the project team will include technical and functional consultants from the client side.



§ 3.2 Responsibility

The work of this project is completed by a project team composed of Ethane Autoplane Co.Ltd. and the client side, which means that the two parties form a common

working group in the project to complete each project task. The main consideration of this arrangement is to ensure that the design and manufacturing of the flight and the car meet the customer's requirements during the project, and when necessary, communicate with the customer about the design details of the flying car, and coordinate the design between the designer and the customer. Only in this way can the order of the design and manufacturing of the flying car be guaranteed.

Specifically, the division of labor and responsibilities of Ethane Autoplane Co.Ltd and the client are:

§ 3.2.1 Project management team responsibilities

Role	Personnel	Description
Steering Committee Member/Project Director	Related personnel	➔ Support and monitor project actions; ➔ Review/approve the project plan with the leader; ➔ Review/modify/approve the guidelines proposed by the project team with the leadership; ➔ Provide advanced project management guidance and assistance; ➔ Evaluate the design and manufacture of products to ensure that quality meets certain requirements, timely delivery and cost control.
project manager	Related personnel	➔ Provide project management services; ➔ Coordinate the allocation of resources among all project teams; ➔ Develop, monitor and implement project plans and related work schedules; ➔ Organize project progress status meetings, prepare/release project communication/reports; ➔ Monitor project progress, task completion, and resource allocation and benefits of the project; ➔ Management issues to resolve progress; assign priorities and monitor the implementation of relevant corrective actions; ➔ Manage the change control process; ➔ Assist in defining change management needs; ➔ Provide general advice or support on functional/technical matters.
Project supervision	Related personnel	Provide supervision, consulting and support for business, technology, management, etc.

§ 3.2.2 Product development team

Role	Personnel	Description
Development manager	Related personnel	➔ Provide project management services; ➔ Coordinate the allocation of resources among all project teams; ➔ Develop, monitor and implement project plans and related work schedules; ➔ Organize project progress status meetings, prepare/release project communication/reports; ➔ Monitor project progress, task completion, and resource allocation and benefits of the project; ➔ Management issues to resolve progress; assign priorities and monitor the implementation of relevant corrective actions; ➔ Manage the change control process; ➔ Assist in defining change management needs; ➔ Provide general advice or support on functional/technical matters.
Functional engineer	Related personnel	➔ Provide relevant knowledge to realize the function of flying vehicles; ➔ Prepare a detailed implementation plan for the project task; ➔ Business needs and variance analysis; ➔ Provide guidance and advice for system design; ➔ Guide and help define requirements and methods related to process and end-user training; ➔ Lead system configuration, enablement and security work; ➔ Auxiliary and participate in system testing strategies, planning and test execution; ➔ Lead and find faults and problems found in integration testing; ➔ Provide consulting services during the development of the end user process; ➔ Provide consulting services related to end-user training materials and training implementation.
Technical engineer	Related personnel	➔ Teaching knowledge related to the design and manufacture of flying vehicles; ➔ Prepare an implementation plan for the technical project components; ➔ Prepare indicators and estimates, participate in variance analysis, and assist with product design; ➔ Responsible for the primary responsibility for custom development listed in the scope definition, or provide the functionality described in the project definition as needed; ➔ Advice and assistance in the design of technical environment architectures and processes; ➔ The leader found problems in the system test and user acceptance test.

§ 3.2.3 Project promotion team and coordination group

The ultimate owner of a flying car product is not the project team, nor the manufacturing staff, but the entire staff of the project, including the leaders of all departments and all employees. So throughout the project, the involvement, input, and support of these people play a key role in the success of the entire project. It is therefore necessary to clarify the responsibilities of these people for the project.

Role	Personnel	Description
Project promotion team member	Related personnel	➔ Responsible for the promotion and promotion of flying car products; ➔ Timely solve problems in the process of project implementation and communicate with the project team; ➔ Responsible for organizing personnel to participate in end-user testing of the product; ➔ Ensure that all employees in the department receive adequate product production design training; ➔ After the product is successfully developed, ensure that all system-related manufacturing processes in the department are carried out according to the project design, for example, in accordance with the determined approval rules.
Project coordination team member	Related personnel	➔ Cooperate with the project team and department leaders, coordinate the specific work carried out by the production and manufacturing system in the department, and serve as the working bridge between the project team and the department; ➔ Responsible for collecting and collating data according to the requirements of the project team. After the data migration is completed, the project team is responsible for data verification; ➔ Participate in end-user training as required by the project team; ➔ Responsible for organizing employees of the department to participate in manufacturing system training; ➔ Responsible for other communication and coordination work between the project team and the department.

§ 3.2.4 Other participants and groups of the project

Role	Personnel	Description
Key user	Related personnel	➔ Representatively participate in project teams, user testing, and support group activities; ➔ Experience the product and provide feedback.
User test group	Related personnel	➔ Representing the interests of business owners and end users in key actions; ➔ Provide advice/assistance when the project makes decisions that affect the end user; ➔ Is a decision maker who decides whether a product can be accepted; ➔ Provide feedback.
Training/ Process / Test Group	Related personnel	➔ Representing the interests of business owners and end users in key actions; ➔ Responsible for the development and execution of strategies and plans related to end-user training business process improvement and end-user testing.

§ 3.3 Responsibility matrix

● Be responsible
✦ Participate/guide
✧ Supervise

Project task		Key deliverable	Party B				Party A
			Project manager	Project supervision	Development team	business manager	Project manager
Project begining	Signing the project charter	Project charter	●			✦	●
	Project implementation plan	Project outline plan	●	✦	✦	✦	✧
	Hold a kickoff meeting	Meeting record	●	✦	✦	✦	●
Project product planning	Product design and development	Product design document	●	✦	●		●
	Product testing	Product testing document	✦	✦	✦		✧
Project testing	Safety test	testing report	✦	✧	●		✧
	Performance Testing	testing report	✦	✧	●		✧
	User experience test	testing report	✦	✧	●		✧
Project closing	Technical handove	Project operation and maintenance plan	●	✧	●		✦
	Project Acceptance	Project acceptance report	●	✧	●	✦	●
Project management	Weekly meeting	Weekly work summary and plan	●	✧	●	✦	●
	Project event management	memorandum	●	✧	●	✦	●
	Demand change	Request for Change Request Form	●	✧	●	✦	●

Chapter 4

Project Plan

This project will follow the system implementation methodology summarized by the company in the field of manufacturing system implementation. The project will follow this implementation methodology.

§ 4.1 Project phases and key tasks

According to the implementation methodology, the whole process of the project is devided into 4 following phases.

- **Project preparation** — *Object definition*
- **Blue print design** — *Target decomposition*
- **Manufacturing** — *Aims achieved*
- **Acceptance of delivery** — *Customer value realization*

Each step of the four-step implementation method is divided into tasks in detail, and the specific work content, work time, work mode, person in charge and work results of each step are defined.

The following page are the work breakdown structure(WBS) of the project.

Work Breakdown Structure(WBS) of the project

§ 4.2 Timeline

According to the above implementation methodology, the specific implementation plan of this project is as follows, and the project work will be carried out according to this plan. The planned whole life cycle of the project is 16 years until 2035.

The following page shows the Gantt chart of the project.

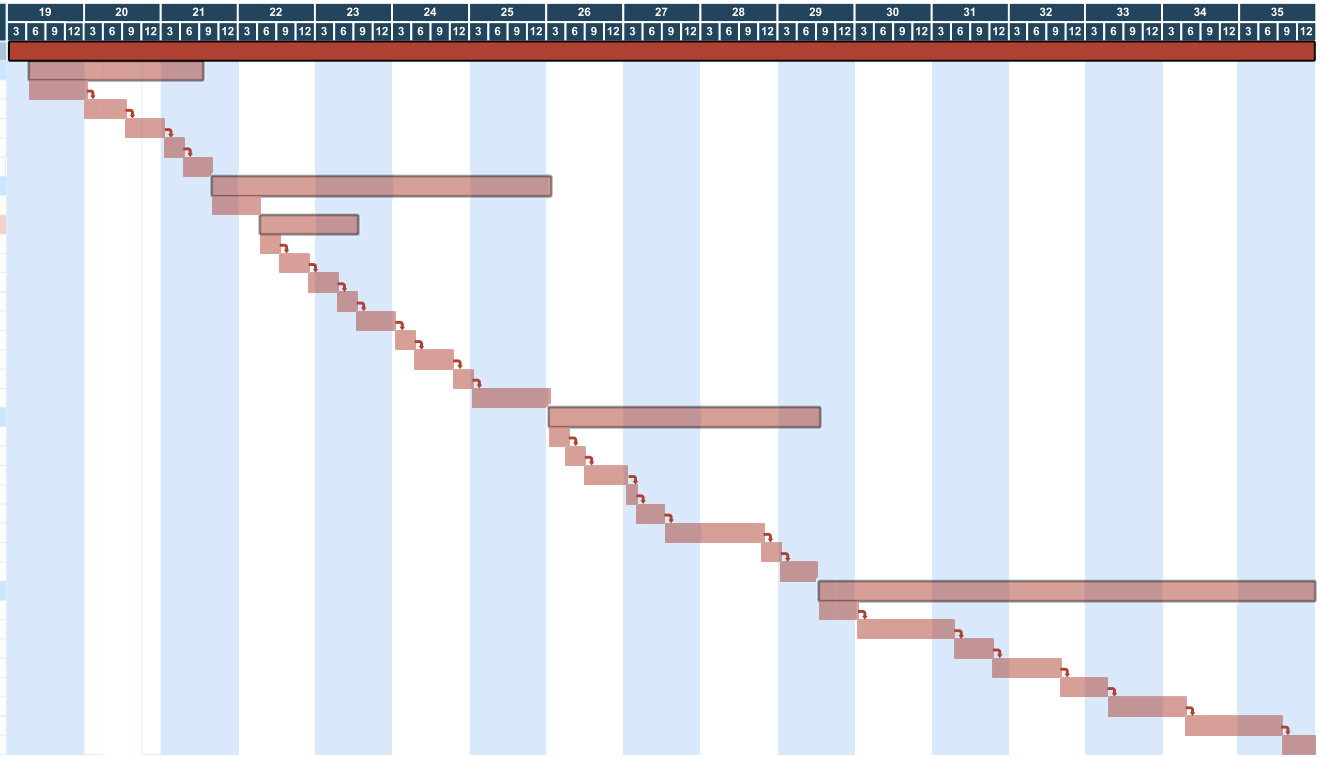
§ 4.3 Milestone

A milestone is a point in time used to mark the events or major accomplishments of the project team, as well as to mark the progress of the project. The major milestones and associated timelines for the Flying Car project are as follows:

Project phase	**Milestone**	**Planned date**
Project preparation	Officially approved	
	Reliability analysis completed	
	Market survey completed	
	Cost estimates, budget allocations	
Blue print design	Establish a design team	
	Completion of Concept selection	
	Completion of pneumatic design	
	Completion of overall design	
	Completion of simulation experiment	
	Safety verification	
Manufacturing	Production Bidding, Select Manufactures	
	Assembly completed, prototype offline	
Acceptance of delivery	First trial flight	
	Obtain Airworthiness Permit	
	CustomerDelivery	
	Market Expansion	

Gantt chart(Timeline) of the project

	Task Name	Duration	Start	ETA
1	Complete project execution	16 years	19.05.01	35.12.31
2	Project Preparation	28 months	19.05.01	21.08.31
3	Project Evaluation	5 months	19.08.02	19.12.31
4	Feasibility Analysis	6 months	20.01.01	20.06.01
5	Market Research	7 months	20.06.02	20.12.31
6	Requirements Analysis	6 months	21.01.01	21.05.31
7	Cost Estimation	3 months	21.06.01	21.08.31
8	Blue Print Design	5 years	21.10.01	25.12.31
9	Conceptual Design	7 months	21.10.01	22.04.30
10	Appearance Design	16 months	22.05.01	23.08.31
11	Car Body Design	4 months	22.05.01	22.08.31
12	Car Body Material Selection	3 months	22.09.01	22.11.31
13	Chassis Design	6 months	22.12.01	23.05.31
14	Chassis Material Selection	3 months	23.06.01	23.08.31
15	Interior Design	4 months	23.09.01	23.12.31
16	Control System Design	4 months	24.01.01	24.04.30
17	Power System Design	5 months	24.05.01	24.09.30
18	Safety Design	4 months	24.10.01	25.01.31
19	Modeling and Simulation	11 months	25.02.01	25.12.31
20	Manufacturing	3.5years	26.01.01	29.07.31
21	Material Order	3 months	26.01.01	26.03.31
22	Drawings Preparation	3 months	26.04.01	26.06.31
23	Production Bidding, Select Manufactures	6 months	26.07.01	26.12.31
24	Supervising of Production Process	3 months	27.01.01	27.03.31
25	Quality Control(QC)	5 months	27.04.01	27.08.31
26	Parts Production	3 months	27.09.01	28.11.31
27	Transportation	13 months	28.12.01	28.12.31
28	Final Assembly	6 months	29.01.01	29.06.31
29	Acceptance of Delivery	7.5 years	29.08.01	35.12.31
30	Trial Flight	6 months	29.08.01	30.01.31
31	Test Flight Data Processing and Analysis	3 months	30.02.01	31.05.01
32	Correction and Optimization	5 months	31.05.02	31.09.31
33	Obtain Airworthiness Permit	12 months	31.10.01	32.09.31
34	CustomerDelivery	8 months	32.10.01	33.05.31
35	Maintenance Personnel Training	12 months	33.06.01	34.06.01
36	Establish After-Sales Service Station	13 months	34.06.02	35.06.31
37	Market Expansion	6 months	35.07.01	35.12.31



§ 4.4 Project plan execution and report

The project manager is primarily responsible for monitoring the progress of the project. The project plan is the key document used to inform the progress and current status of the project. The project plan includes project phase, task, duration, resources, scheduled start and end dates, milestones, persons responsible, and deliverables. The Project plan will be maintained by **XXX** and will reflect the Project methodology planning phase.

Only in two cases can the entire baseline plan be redesigned. One is that the entire baseline plan should be updated whenever there is any scope change that fundamentally affects project progress. Similarly, when schedule or budget deviations are significant, benchmark plans need to be reworked to make performance reports meaningful again.

The execution and reporting of the project plan shall be carried out in accordance with the following procedures: each project team member shall be responsible for updating the actual progress according to the project plan and estimating how long it will take to complete the tasks assigned to him/her as part of the weekly project report meeting. The project management team meets every Friday to review project progress against the project plan. The review is based on a review of delays, focusing on identifying existing or potential task delays, assessing the impact on the project, and agreeing on action plans to be taken to mitigate the impact. Project managers highlight tasks that may be delayed (e.g., expected completion time is later than planned). The person in charge of the task should develop an action plan for potential delays to minimize the impact on other project work. The project team leader shall indicate the possible task delay in the problem section of the weekly status report, including a brief description of the problem, a brief description of the action plan to prevent the delay or the date of the new task, and the date shall indicate the impact on other tasks.

Chapter 5

Project Document Management

§ 5.1 Importance of project document management

The implementation of the flying car project manufacturing management system is a complex system. To ensure the ultimate success of the project, it must be strict control is carried out at every stage of the purpose. The project's documentation reflects the project's work process and results and is the basis of project control. According to it, it is also a key carrier of "knowledge transfer", so it is necessary to fully document the entire process of the project.

This document specifies the documents that need to be written during the project process, including project management documents, project technical documents and projects function documentation, etc. In addition, this document also describes the specific requirements for documentation, and the project team members are making these documents. It must be carried out in accordance with these requirements and must be signed by the corresponding responsible person.

§ 5.2 Project document system

The corresponding documents need to be written at different stages of project implementation. The table below shows which documents are needed at which stages of the project, and the corresponding file format, encoding rules and required date of completion.

File name	Project stage	File time	signature
Project implementation and work plan	The beginning of the project		
User demand report	The beginning of the project		
Evaluation report	All the stage		
Design Report	The beginning of the project		
Design evaluation report	After design test		
Material purchase application	Middle stage		
Test result report and assessment	Middle stage		
User Training Program	Middle stage		
User Manual	Middle stage		
User training materials	Middle stage		
Flying car production plan	Last stage		
Maintenance Documentation	Last stage		
Reconciliation Confirmation Report	Last stage		
Product Quality Check Report	Last stage		

The main contents and purpose of the report listed in the above table are explained below:

- **Project implementation and work plan:**

  At the beginning of the project, the overall time plan, key checkpoints, division of duties and other things make it clear. In addition, in the specific implementation process, there must be a specific work plan, which is generally formulated and checked on a weekly basis.

- **User demand report:**

  Before the start of the project, collect all the user's needs for flying car products, and evaluate the rationality and operability of the demand.

- **Evaluation report:**

  It is the main work result of the system evaluation stage. It summarizes all current business processes, as well as all current business processes and current system inputs (forms, etc.) and outputs (reports, etc.). It should also include a series of function check tables that maps system functions to current business processes at a high level and finds differences from current processes/systems. Besides the report should also include key system interface requirements and data migration strategies.

- **Design Report:**

Based on the design of the system, summarize what changes need to be made to the current business process. In based on the identified process, it should be summarized what configuration of the system is to meet the requirements of the process. For the system to be performed customized development includes reports, and it is up to the functional staff to develop requirements for the effects that development should achieve from a functional perspective.

- **Design evaluation report:**

  Conduct comprehensive experimental and simulation tests on flying car design, evaluate the test result data, analyze the rationality of the design change, and propose modifications to the design plan.

- **Material purchase application:**

  Determine the design drawings of all components and the type, quantity and price of the materials used, and apply for ensuring the rational use of the materials applied and minimizing production costs.

- **Test result report and assessment:**

  Collect and analyze the test flight results of the flying car model machine, propose revisions to the problems that arise in the flying car model, and summarize the impacts of subsequent problems, including human resources, material additions, extension of completion time and so on.

- **User test cases and results:**

  Flying car project team members should write system integration test cases according to their determined business processes. Make sure these cases include all of their business processes. Follow the impact of these business cases on the current process and the impact on other processes and steps should also be included in the case. When the user conducts the test, the actual test should be recorded. The results are compared with the expected results.

- **User Training Program:**

  Develop a training plan prior to the start of the training, and arrange the training process, course, and participants.

- **User Manual:**

  User's guidance and reference manual for operating the system. It should include all that is determined by Ethane Autoplane Co., Ltd. Business processes and the functions of the system are organized in a way that is a business process. After the new user has received training in system use, according to the policy of the manual and business process, the operation of the system should be completed.

The manual will also serve as an end user part of the materials used in the system training.

- **User training materials:**

  The materials used for end-user training are combined with the user manual to train end users.

- **Maintenance Documentation:**

  A maintenance manual for the flying car administrators. It should be written in conjunction with policy. It should include a description of the flying car architecture and the software and hardware platforms used; distribution (production, development, testing, etc.); system startup, shutdown, backup, performance monitoring, and common maintenance instructions for use, etc.

- **Reconciliation Confirmation Report:**

  Verifies each month's salary calculation results during the support period.

- **Product Quality Check Report:**

  Summarize the status of the system up to date and analyze the main problems and solutions in the past. Advice on further improvements and improvements in system use.

All project documentation is written in English only. The signature of the document is, in principle, completed by the manufacturing operations leader. For the key project phase summary reports such as the system online report, it is necessary to report and discuss at the project meeting, and finally the leadership sign is confirmed. At the same time, due to the tight schedule of the project, to ensure that the project can proceed according to the plan and ultimately On the planned date, the signing of the project document should be completed within 5 working days of the submission of the document. If more than 5 jobs it is still not signed, it will be deemed to have been signed and confirmed, and the work of the project team will be carried out in accordance with these documents.

§ 5.3 Project document management environment

As part of project management best practices, project documentation should be maintained within a centralized and controlled environment. This not only ensures the standardization of the project documentation, but more importantly, it provides a convenient platform for the knowledge sharing of project stakeholders. The documentation for this project is maintained in the Flying Car Project Document Management Server. The specific address is: www.XXX.com.

Chapter 6

Project Communication Management

§ 6.1 Project decision process

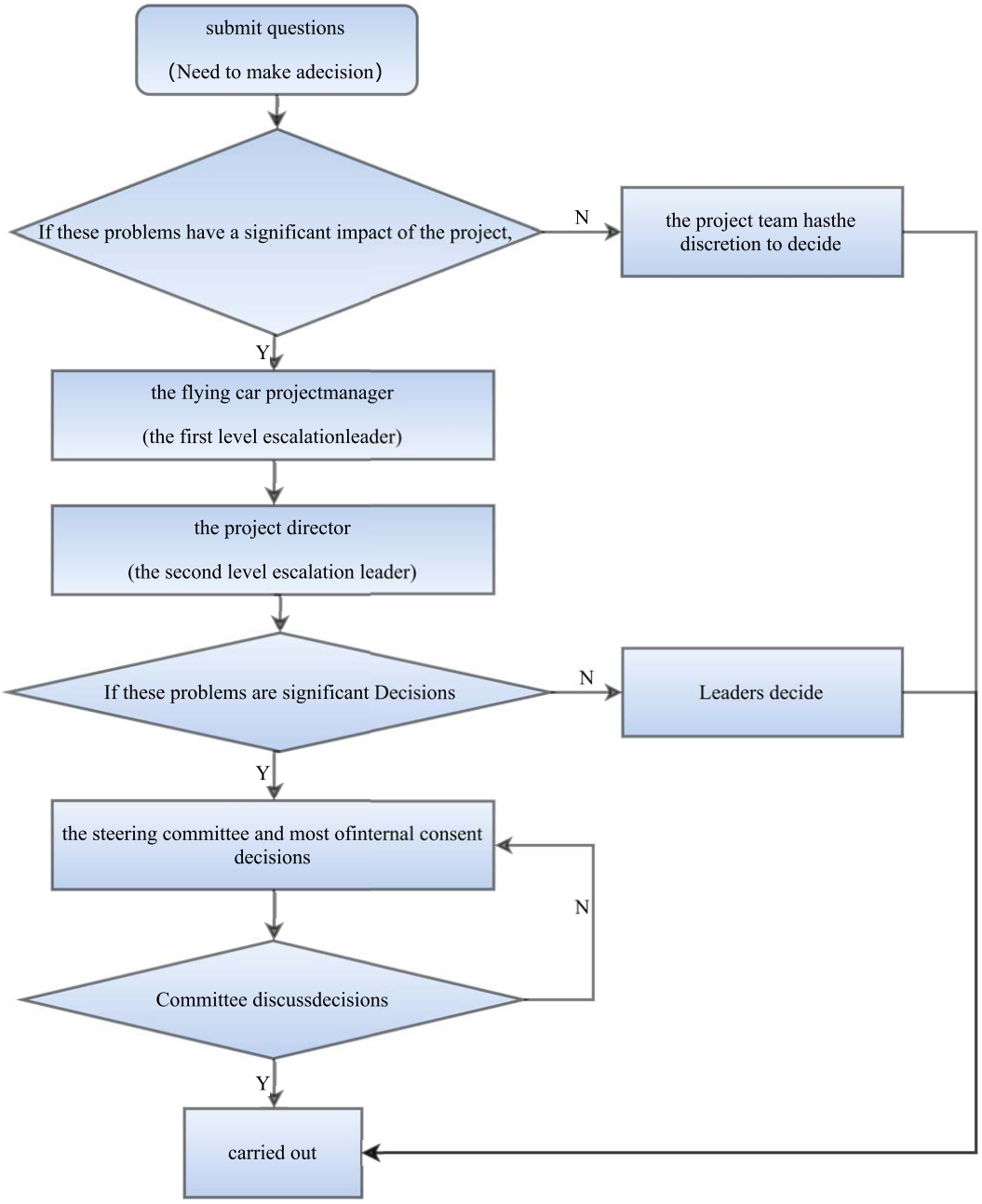
The decision making and reporting processes described below are related to daily challenges and decisions. Some challenges may result in project scope, resources or time. The change of the table needs to be handled by the change control process described in the change management.

For decisions that do not have a significant impact on the scope, resources or timelines of the project, the project team has the discretion to decide. Decision making the first level escalation leader is the flying car project manager. The second-level reporting leader is the project director. Before reporting to a higher level, at a certain the level leadership office may not report more than twice. Need to get input from the steering committee or need to get most of internal consent decisions are limited to the following: (I) Decisions that have a significant impact on flying car project's existing business processes; (II) Decisions will affect flying car project key Policy decisions; (III) decisions that bring significant changes to the scope, timelines, functionality, or costs of the project. These are referred to as "significant Decision". A decision flow chart is given on the next page, which details the process.

§ 6.2 Project meeting

The Flying Car Project Communication Plan is used to clarify the objectives, scope, processes, and plans for communication for project implementation and training to ensure project leadership, guidance, consultants, and working groups receive timely and accurate information. The target audience for project communication is:

- Steering Committee
- Project Director



- project manager
- Core project team
- End user

Every Thursday 14:00-15:00 All members of the project team will meet once. The meeting was hosted by the project manager and worked for the past week. To summarize, discuss the problems and solutions in the project work, and arrange the work for next week. Project team and the special project meeting of the management team will arrange the dates according to the situation.

Every Friday 14:00-15:00 The project holds a management meeting, including flying car project director, project manager, and small group leader. At the meeting, the project

status report submitted by the project management team will be received, and the project management status report submitted once a week will be taken as develop the main basis for the Steering Committee's report. Project director's development and submission of the steering committee status report and organization of the report work is primarily responsible.

Chapter 7

Project Risk Management

During project implementation, there will be inevitably some problems and risks. It's very important to summary timely, consider seriously, coordinate correctly and make the right decision.

Our budget is about 200 millions dollar at the beginning. We plan to cooperate with the government and some other companies later. As a result, we have a very strong risk tolerance. Trying to promote the development of the flying car, we prefer using the new technologies such as composite materials, AI. Though this preference will cause more risks.

To identify the risks, we used the brainstorm, interview and research methods. But the SWOT analyse method was mainly used.

§ 7.1 SWOT analysis

§ 7.1.1 Strength

- We have a enough budget to support the project as mentioned at the beginning of this chapter,. This will become our very important key.

- There are many mature and advanced design, technologies to apply as the technological development is changing with each passing day. We can have more options to solve the problems.

- We have many experienced engineers and designers from the field of automobile and the domain of the aircraft.

- Nowadays, people buy more and more cars, which makes the traffic jams worse. According to the market analyst, the the flying car is prospective in 20 years.

§ 7.1.2 Weakness

- Our company don’ t have any experience of designing a flying car before, which requires our two domain engineers and designers work together.
- Our company is short of the professional airworthiness personnel who has the ability of transforming the regulations of the airworthiness certification to the detail technical criteria.

§ 7.1.3 Opportunity

- Make a breakthrough to our company in the flying car design.
- Other flying car companies give us technical or kind of supports.
- Become a leader in the flying car market by using the new technology.

§ 7.1.4 Threat

- Similar companies raise certification standards and cause project failure.
- Meet many pressures from the other same kind of companies when our products come into market.
- The project that involves in many departments makes the management complicated.
- There are some other unstable and unknown factors will threat our project like the financial crisis.

§ 7.2 Main risks

By using different risks analyse methods, we conclude that the primary risks can be divided into the main risks and some additional risks for the Flying Car project. Their risk score is obtained by the risk matrix table attached at the end of this chapter. The main risks generally include the following four parts:

§ 7.2.1 Technology and design risks

The Flying Car need to fly and have the ability of collision. As a result, it have to balance the relation between the weight and the strength, which takes more challenges to our engineers and designers. These challenges will bring more risks to the project compared to the traditional car project. The project may be failed due to the technology and design challenges. It’ s risk score is 1.

1. Use some advance technologies and materials to overcome the challenges.

2. Optimize the load factor on the body to decrease the material request.

3. Use some special structure design to balance the weight and the strength.

§ 7.2.2 Certification risk

Our project Flying Car must obtain two certifications: the certification of the car and the certification of airworthiness. The certification will last for a long time especially the certification of airworthiness, the long-time certification procedure may block our project progress.

Something worse is that the structure or some systems need to be redesigned and then may restart the certification of the airworthiness. This risk will block the project progress seriously. The certification risk score is 1.

1. Make a clear design-certification-production timetable.

2. Store the technological documents for the future certifications.

3. Use the simulator to test and verify the product for the certifications.

4. Engineers and designers should think twice and verify the characteristics before handling on the final product.

5. Refer to the design and solutions of other similar products.

§ 7.2.3 Market risk

As a new kind of transportation, we can not assure our Flying Car market and whether the customers accept the product. It' s a risk that our product may not be very popular and the sells can' t meet our expectation.There is a big risk that our Flying Car may won' t have the available airspace. The market risk score is 5.

1. Cooperate with the government to apply for the airspace.

2. Propose a flying car management method.

3. Make some advertisements on TV, radio and the Internet.

4. Organize some test activities to show our Flying Car' s safety and efficiency.

§ 7.2.4 Budget risk

Firstly, the usage of the advance technologies and materials like the aluminum alloy and the titanium alloy will require a big expense; Secondly, the certification of the airworthiness requires several fly tests. The fly test and the redesign will cost a lot and bring

some useless expenses; Thirdly, the advertisements and the organization of the activities will cost a lot of our budget.

It' s very possible that these three factors lead us to run out of out budget and cause the project failed. The budget risk score is 8.

1. Cooperate with the government to get the financial subsidy.
2. Cooperate with other companies to be financed.
3. Decrease the predefined performance level.
4. Loan to banks.

§ 7.3 Additional risks

There are some additional risks too, which are concerned with the implementation, the production and the management. They are listed as following:

§ 7.3.1 Implementation risks

This project is involved with many departments who may have different implementation situation. It' s very possible that some departments can' t guarantee the progress and that there will be some implementation cycle delays. The implementation cycle delays will interrupt the project. This risk score is 6.

1. The hole company need to set a unique design-production timeline and apply the manage.
2. Build a clear information transmission and step synchronization at the beginning of the project.
3. Make a clear holiday arrangement at beginning to avoid the risk of the interruption by the holiday like the Christmas.

§ 7.3.2 Production risks

To product a flying car, there are many manufactures to cooperate with each other. And these manufactures may come from different regions and different countries. So it will be a big problem to synchronize these manufactures and to guarantee their tasks. We may cause some misunderstands due to the different languages and different cultures. The production risks will block our flying car production procedure. This risk score is 7.

1. Send a quality checker and a progress monitor to the manufactures. They send back the report to the headquarters frequently.
2. Hire the qualified translator who has the ability of the foreign language, who knows well about the foreign culture and who has the relative diploma.

§ 7.3.3 Worker risks

1. Worker has a negative response to the project implementation, lacks of passion, idleness, etc. The risk score is 6.

   Solution: Establish effective reward and punishment measures and publicize it' s consequences.

2. invalid project organization. The risk score is 9.

   Solution: According to the progress of the project, dismiss or reorganize the project organization.

3. Spread rumors and crack down on project implementation team members. The risk score is 10.

   Solution: Regularly announce the progress of the project implementation and impose penalties on those who spread the rumors.

4. The middle and senior leaders arranged other affairs to the implementation people, resulting in the implementation progress not being completed on time. The risk score is 6

   Solution: If the implementation people need to deal with other matters, he must be approved by the project implementation leadership team.

5. Because after the new process is established, it may affect the interests of relevant personnel, especially the interests of middle and high-level, leading to resistance to the project and ultimately affecting the project implementation process;The risk score is 5.

   Solution: Convene a special middle-level and high-level coordination meeting to implement a unified understanding of the Flying Car project, clear goals, and coordinate their interests by the top leadership.

§ 7.3.4 Management risks

1. The departments meet conflicts during the application process. The risk score is 6.

   Solution: Senior leaders give arbitration from the overall interests of the company.

2. For the personal benefit, the business processing is performed without authorization. The risk score is 5.

   Solution: The executives of each implementing unit must obtain the authorization.

3. The senior management should stand at the height of overall optimization at a critical moment and conduct arbitration. The risk score is 10.

The following page shows the risk matrix of the program.

Impact / Probability	Low	Medium	High	Very High
Nearly Certain	12	7	3	1
Likely	13	9	5	2
Possible	15	11	6	4
Unlikely	16	14	10	8

Chapter 8

Project Change Management

§ 8.1 Raise the change

To make a change, you must first fill out the REQUEST FOR CHANGE (RFC). The manager handed over to the other project manager. The recipient project manager will evaluate the RFC's technical reliability and impact on the entire project. The RFC agreed by the recipient project manager will submit the project leadership team approval, and the unapproved RFC will be returned to the applicant project manager. Any disputes that cannot be resolved by the project manager of both parties will be submitted to the project leading group for consideration.

§ 8.2 Response from the receiver

The receiver project manager will confirm receipt within three working days of receiving the RFC and explain the time required to analyze the RFC and make the corresponding Engineering Change Recommendation (ENGINEERING CHANGE PROPOSAL, hereinafter referred to as ECP). The receiver party may charge the RFC analysis report and the ECP and inform the customer of the charging standard in writing. The receiver party will analyze the RFC and make the corresponding ECP within 30 days or within the agreed time after the customer agrees to the charging standard.

The ECP will explain the following aspects of the impact of changes proposed in the RFC on the entire project.

- **Basic changes** – the shape and performance of the car
- **Flying design** – performance, stability, reliability changes
- **Test project** – modification of test plan, test and retest
- **Flying performance** – confirm that the impact of changes in the flying hardware

on the performance of the flying car has increased and whether it is necessary to modify other parts

- **Training** – training programs, course preparation and teaching materials
- **Repair** – Instructions for changing the repair and maintenance of the flying car
- **Personnel needs** – confirm whether additional personnel are needed to assist with changes to the speeding project
- **Progress** – progress of the project, speed of delivery of the speeding vehicle and expiration date of the agreement
- **Possible cost**

§ 8.3 Approval of the applicant

The applicant's project manager is required to confirm the ECP in writing. Any dispute that cannot be resolved by the project manager of both parties will be submitted to the project leadership team for review.

After the applicant's project manager confirms, if the modification involves the project contract or cost, it must be approved by the project leading group.

The approved ECP will be listed as an agreement in the Statement of Work in the form of an "Engineering Change Proposal", replacing any priora sudden agreement.

§ 8.4 Change implementation

Both parties will re-adjust the project plan based on the approved ECP and assign tasks.

Both parties will perform their respective responsibilities in accordance with the new project plan.

§ 8.5 Flow of variation procedure

- The customer or the Recipient submits the RFC in writing;
- Submit the RFC to the other party (or the project leadership team) for a technical feasibility assessment;
- The customer gives the ECP preparation time and required fees in writing;
- The project manager appoints a review panel to discuss the time and cost of the customer and whether to approve the RFC;

- The customer makes the ECP and confirms the required fees and progress;
- The two parties (or project leadership groups) discuss the ECP and propose implementation recommendations;
- The applicant approves the ECP;
- The project leadership team approves the modification of the contract (if needed); Implement ECP.

Chapter 9

Quality Control

- The project charter is reviewed and approved by the project management of both parties.
- Business blueprint is reviewed and approved by both project management.
- User files are reviewed by the project team, project manager.
- The training plan is developed by the project team.

Chapter 10

Acceptance Level

§ 10.1 Acceptance mode

The project adopts a method of submitting results and acceptance in stages. After confirming the results of this phase, we will start the implementation of the next phase. In order to ensure that the project is always carried out under the premise of the implementation of the two sides'consensus.

The acceptance of the project phase will be based on the implementation goals, work plans and submitted phase completion reports confirmed by both parties.

The Flying car's Project Manager(or its licensor) will sign the confirmation report in writing or provide an optimized opinion to the recipient project team within 7 working days from the date of the client's application for acceptance.

§ 10.2 Acceptance criteria(modified according to project conditions)

System module	**Function detail**	**Scope of realization**	**Whether it is completed**
Plan management	Production data management		
	Master production plan		
	Material Requirements Planning		
	MTO		
Production management	Production management		
	Workshop management		
	Equipment management		
	Repetitive production plan		
Kanban management	Kanban management		
	Lean management		