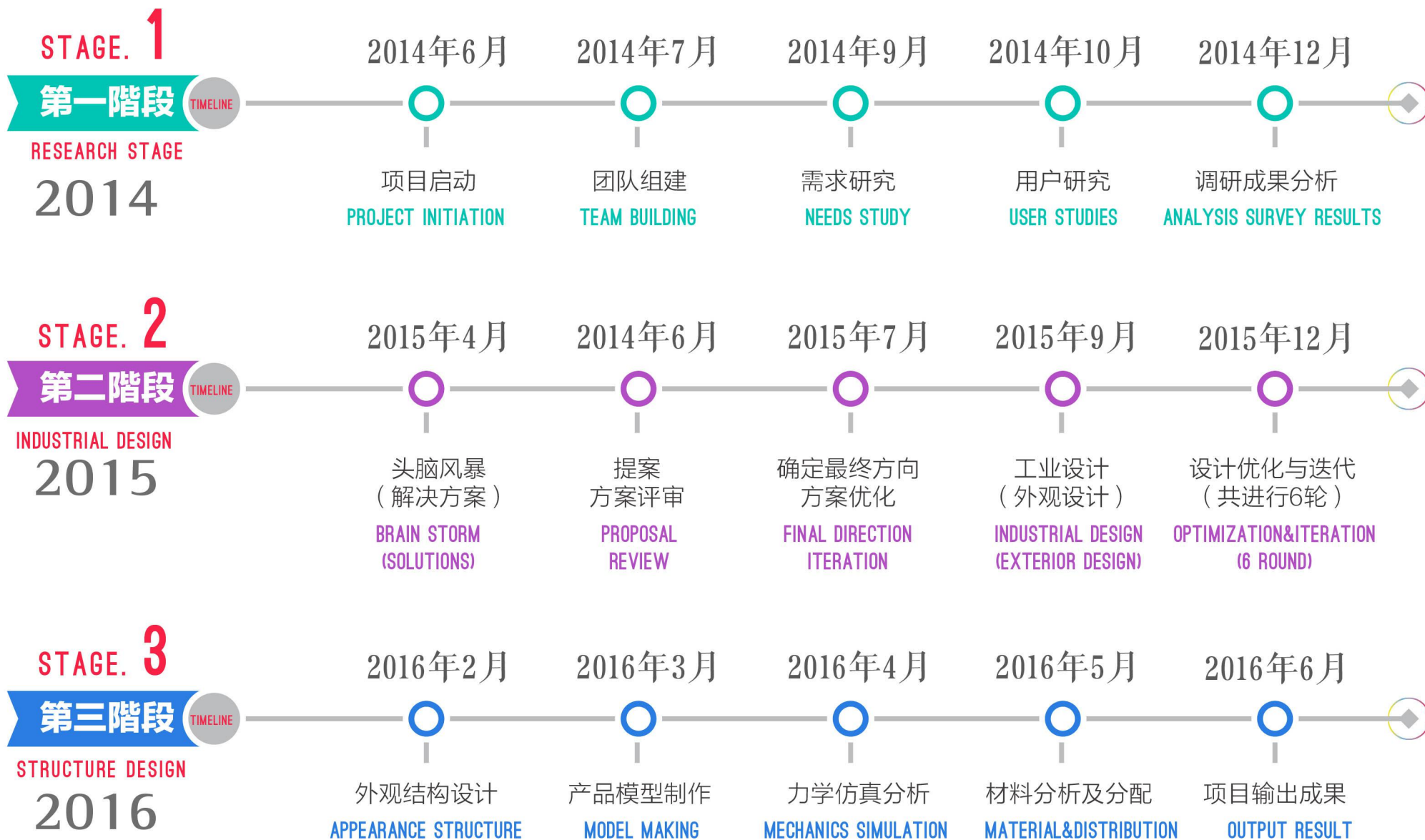


LIFE SLIDE

R E S C U E C A R

This high-level rescue vehicle is enlightened by slides, crane and rescue ladder.



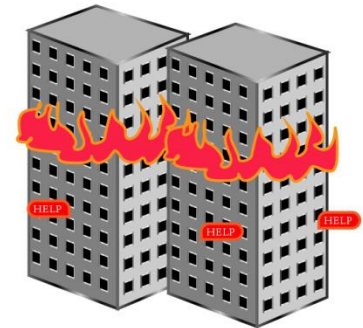




● 1. BACKGROUND ●

如今，絕大部分的都市居民都生活在高層建築中，當發生火災、地震等災害時，高層建築中的居民往往都是無法逃生的，只有等待救援。

Nowadays, most of people who live in the high-rise buildings are unable to escape, only to wait for rescue in the event of disaster, such as fire, earthquake etc.



中國
平均每天有938起火災
Average 938 Times a Day

2015年全年共發生火災**3380000**起（中國），
共造成2854人傷亡，其中1742人死亡，1112人受傷。

當高樓建築發生火災時，由於建築太高，人們幾乎無法逃生，只能等待救援。而如今的高層救援裝備**效率低下**，導致大量的人員死亡，得救的人寥寥無幾。

In 2015, a total of **3380000** fires occurred in the whole year (China),
Resulting in a total of 2854 casualties, of which 1742 people were killed and 1112 injured.

高層火災重要新聞事件 / IMPORTANT NEWS FOR HIGH-RISE FIRE			
時間 / TIME	地點 / PLACE	死亡 / DEATH	受傷 / INJURY
2015/08/12	天津濱海新區	165	798
2010/11/15	上海余姚	58	70
2011/04/25	北京大興	28	35
2014/02/15	吉林省吉林市	54	71
2013/02/02	哈爾濱市	33	65
2010/07/19	烏魯木齊	12	17
2012/06/06	北京市海澱區	25	36
2009/01/31	長樂市	15	54
2005/12/15	吉林遼源	39	77
2005/06/10	汕頭市潮南區	31	28
1994/12/08	新疆克拉瑪依	325	132
2015年全年	中国大陆	1742	1112

沒有及時救援是的主要原因

目前高層救援方式

Current rescue methods

- ◆ **Slow** 速度慢
- ◆ **Inefficient** 效率低
- ◆ **Dangerous** 不安全



1

- 速度慢
- 效率低
- 不安全

主要的
三种方式

Ladder

2

- 速度慢
- 效率低
- 不安全
- 成本高

Helicopter

3

- 速度慢
- 效率低
- 不安全

Manpower

THREE KINDS OF
FIRE FIGHTING
METHODS

目前高層救援方式

Current rescue methods

研究統計

Research statistics



Ladder



At the same time
The number of rescue



Every one needs nearly
20 minutes to be saved

- Slow
- inefficient
- Dangerous



Helicopter



At the same time
The number of rescue



Every one needs nearly
60 minutes to be saved

- Slow
- inefficient
- Dangerous
- Expensive



Manpower



At the same time
The number of rescue

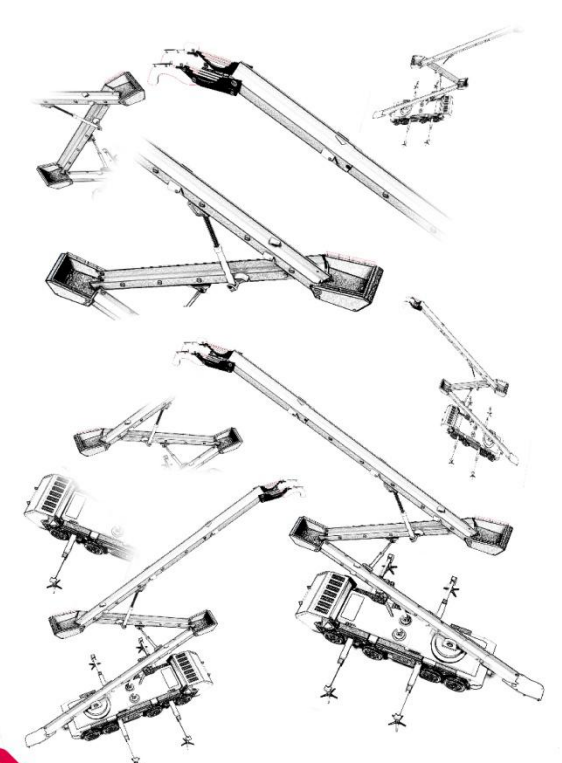
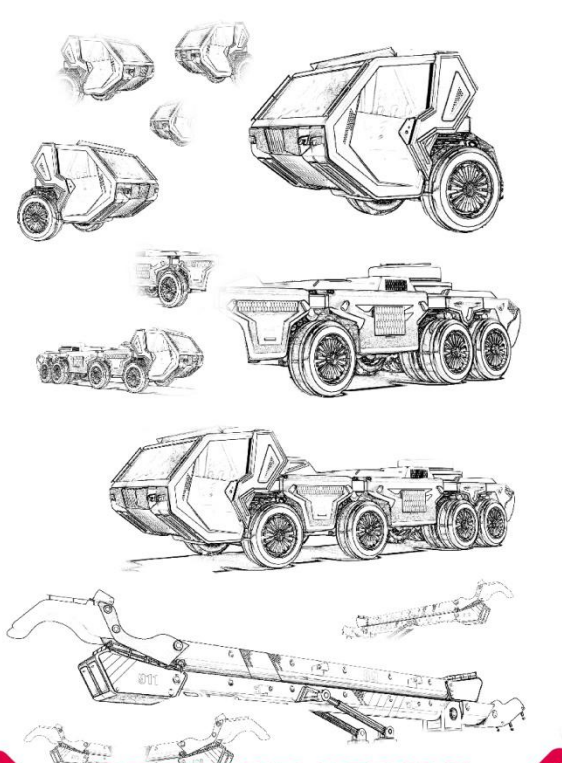
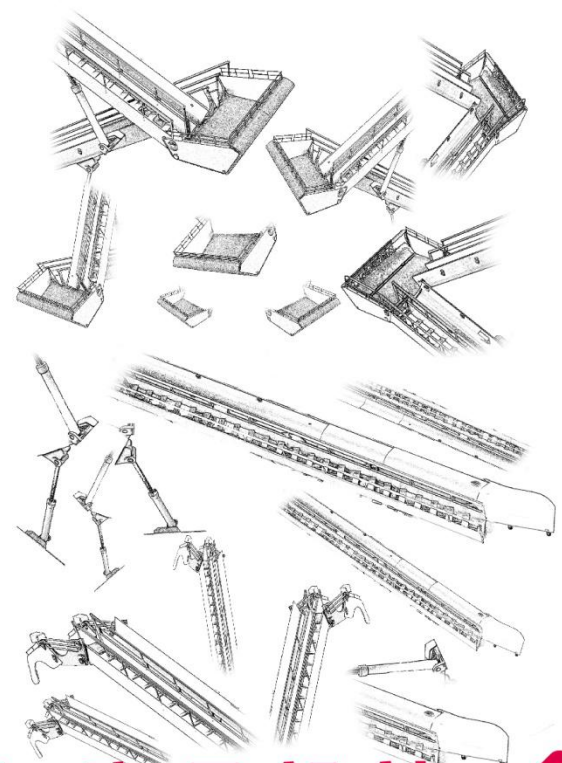
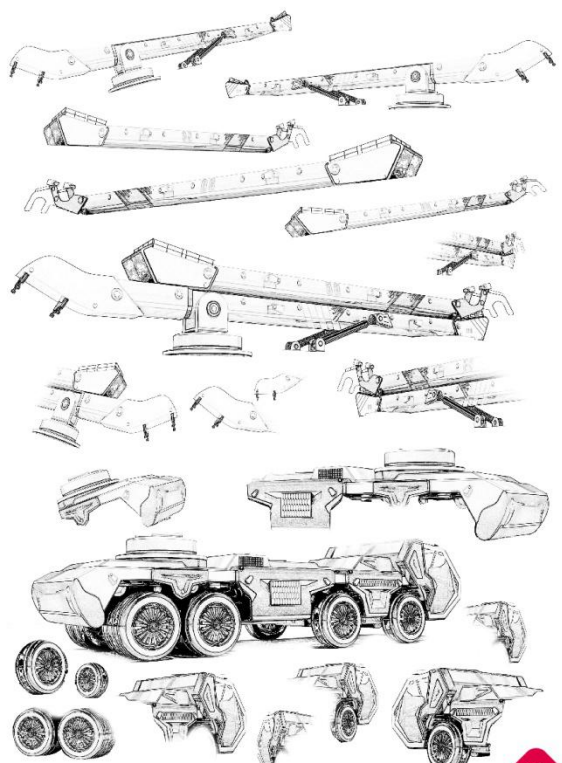


Every one needs nearly
30 minutes to be saved

- Slow
- inefficient
- Dangerous

產品設計
PRODUCT DESIGN





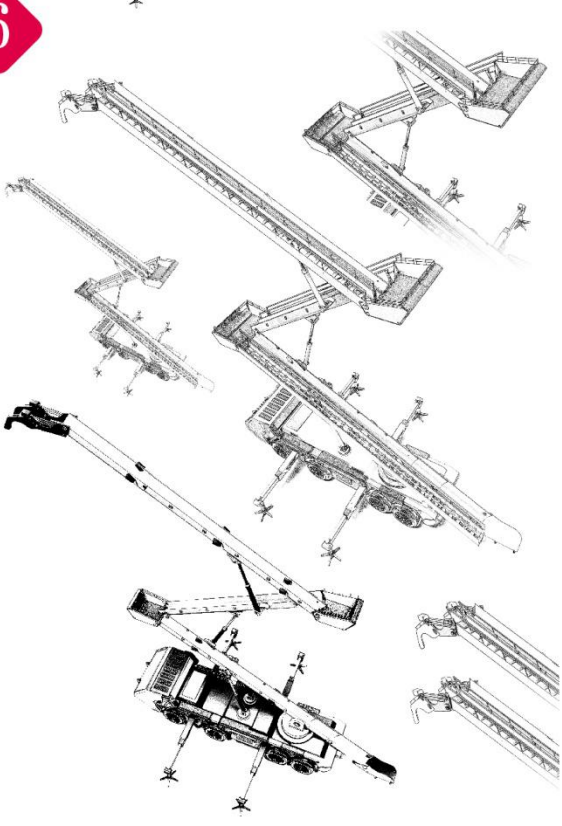
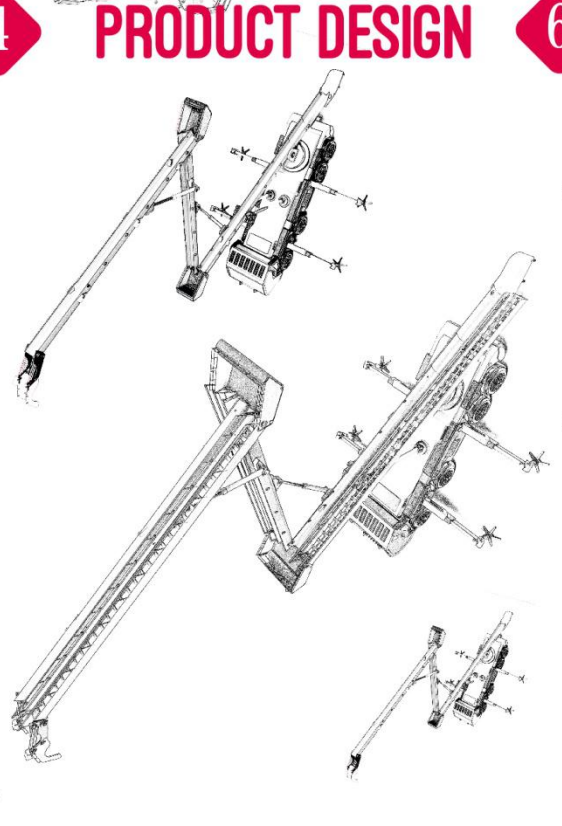
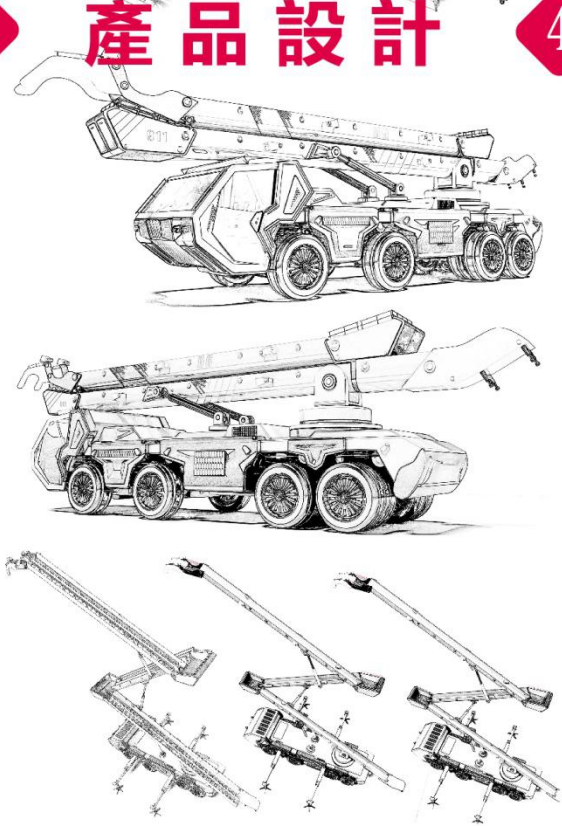
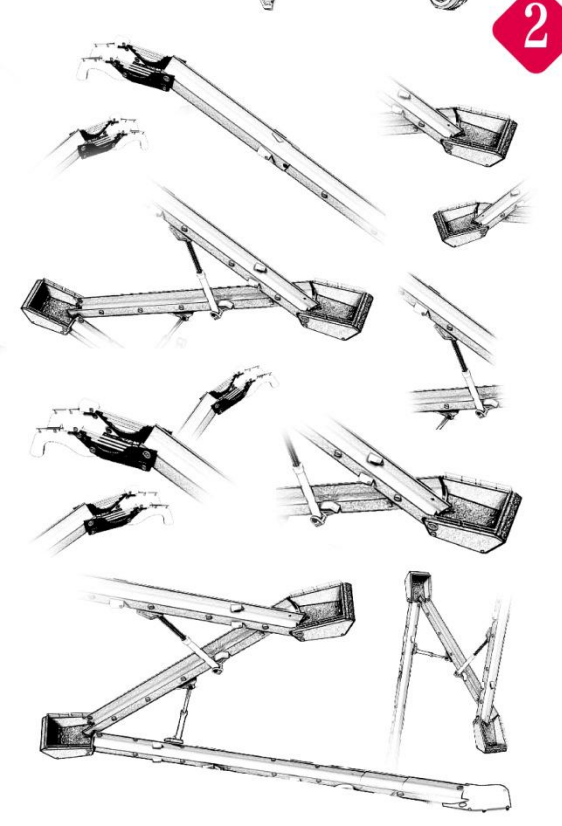
2

產品設計

4

PRODUCT DESIGN

6



團隊

項目

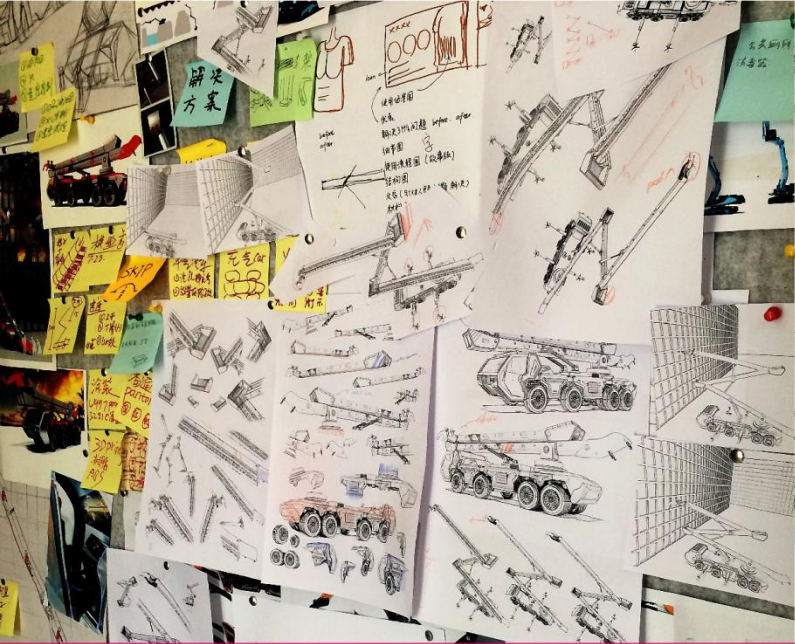
評審



PROJECT
EVALUATION

六 次

6 TIMES



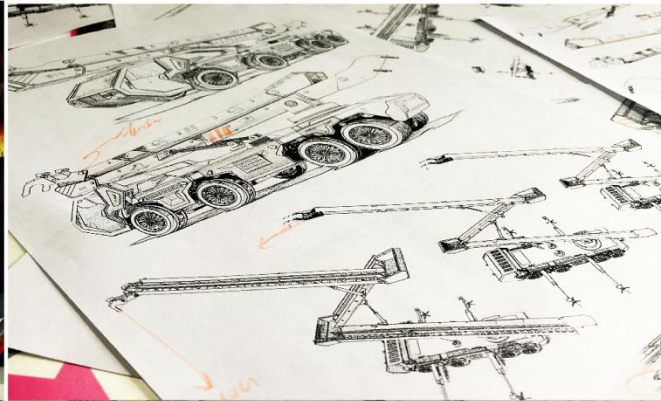
第一次方案評審
Programme review

1



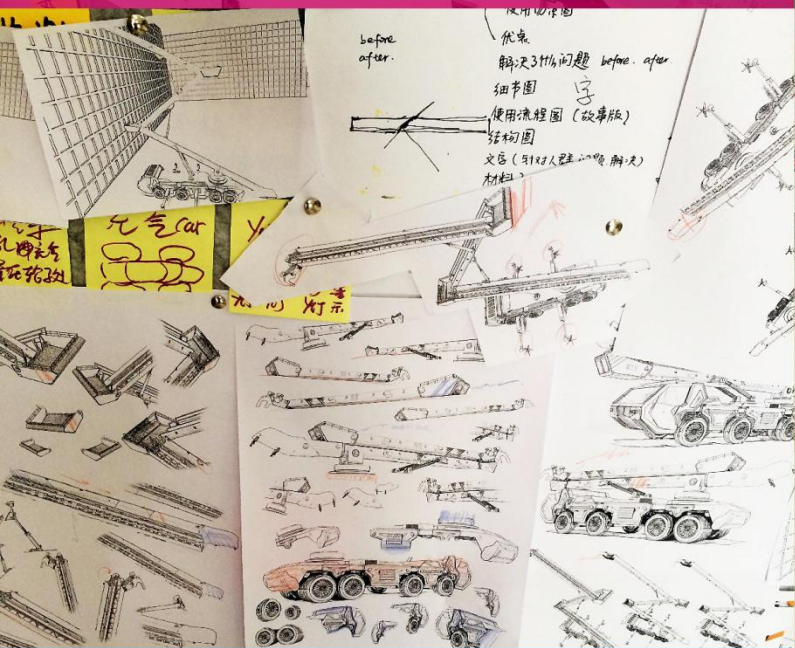
第二次方案評審
Programme review

2



第三次方案評審
Programme review

3



第四次方案評審
Programme review

4



第五次方案評審
Programme review

5

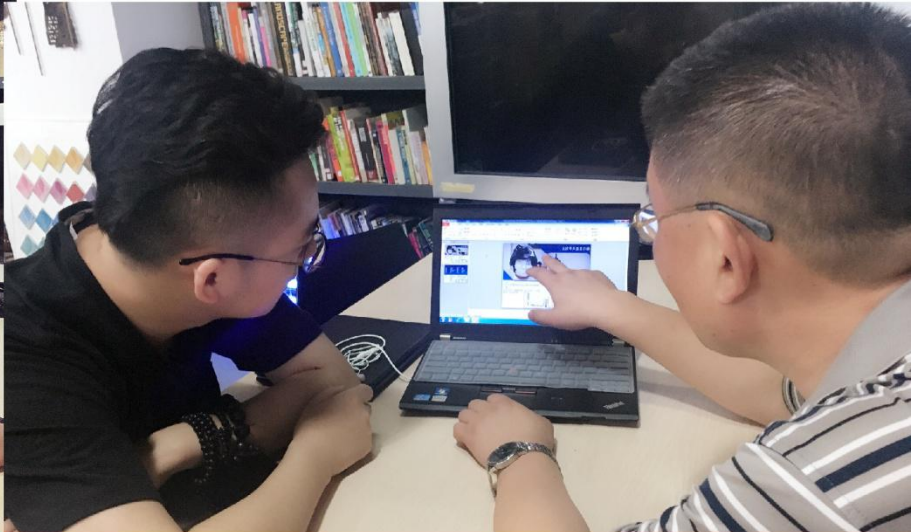


第六次方案評審
Programme review

6



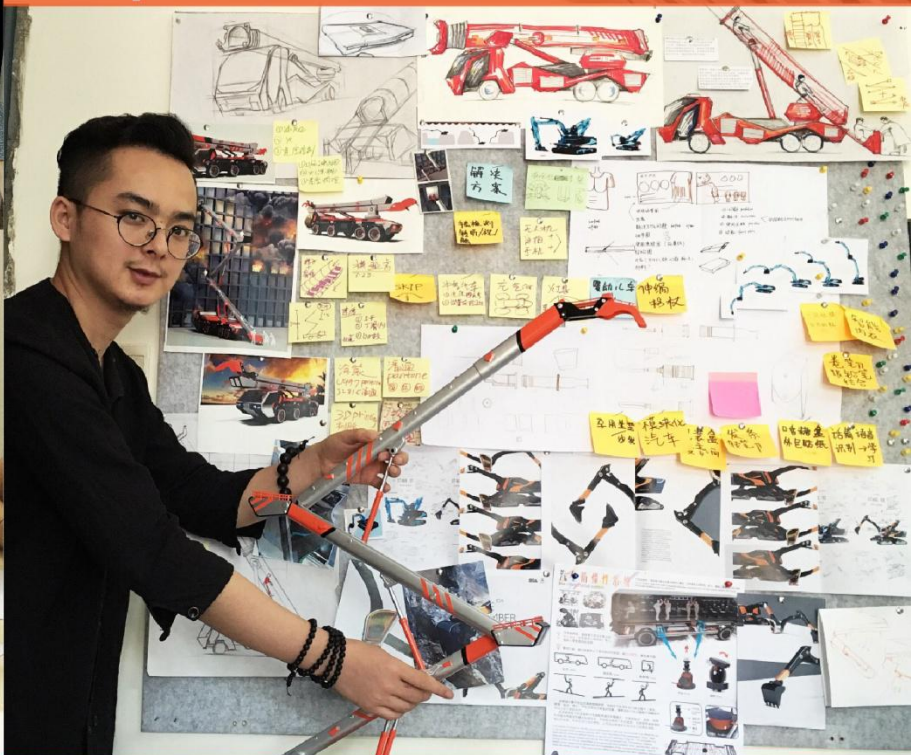
用户研究
User studies



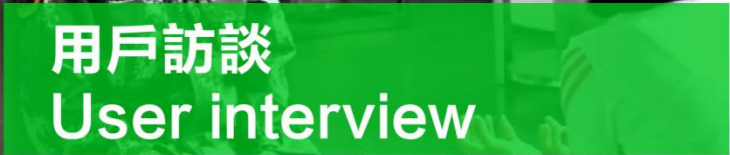
專家訪談
Expert interview



用戶訪談
User interview



模型測試
Model test



最終方案
FINAL SCHEME



PLAN / PROBLEM SOLVING



INSPIRATION SOURCE

解决方案

ABSORB



LADDER



消防滑梯



ESCAPE
LADDER



飛機救生滑梯

吊車/起重機



CRANE



滑梯



SLIDE





There is a folded and telescopic rescue slider on the top of the vehicle, which can be used for adjusting height and angle. People being rescued can slip down from the high-rise building, just like playing slide.

A buffer area between two sections can effectively slow down the rate of decline. It is also designed for guiders and persons who can give some help.

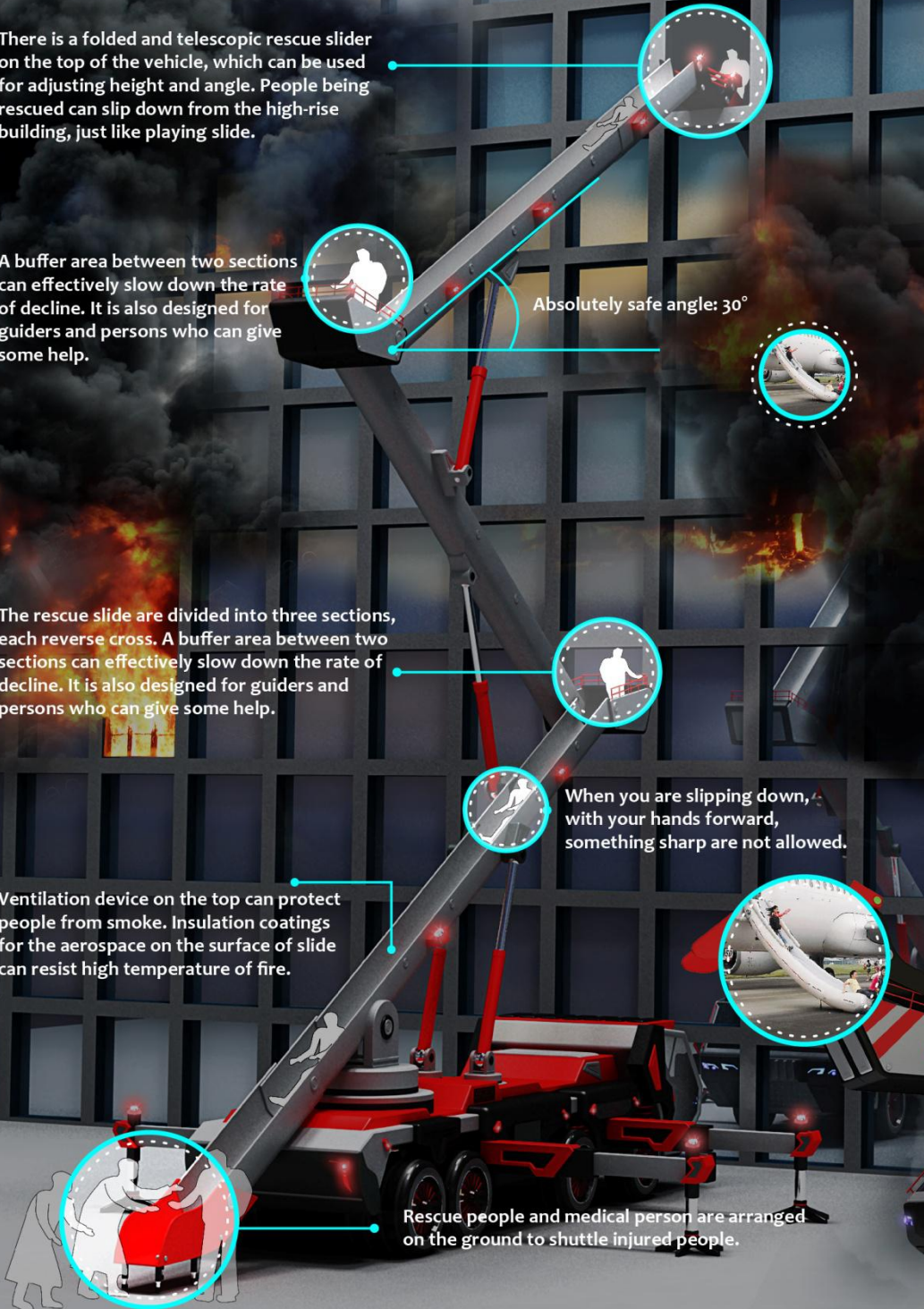
The rescue slide are divided into three sections, each reverse cross. A buffer area between two sections can effectively slow down the rate of decline. It is also designed for guiders and persons who can give some help.

Ventilation device on the top can protect people from smoke. Insulation coatings for the aerospace on the surface of slide can resist high temperature of fire.

Rescue people and medical person are arranged on the ground to shuttle injured people.

Absolutely safe angle: 30°

When you are slipping down, with your hands forward, something sharp are not allowed.





BREAK

CONNECT

Two information lights on the connection of slide and building can show the accurate location of rescue place. Top of the slide can break into the window to facilitate people get out.

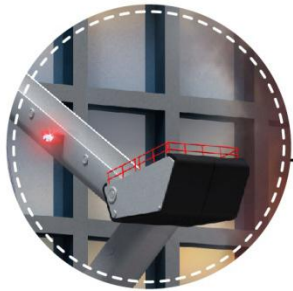


RESIST



SAFE TAXING

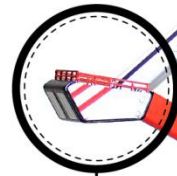
Ventilation device on the top can protect people from smoke. Insulation coatings for the aerospace on the surface of slide can resist high temperature of fire.



HELP

BUFFER AREA

The rescue slide are divided into three sections, each reverse cross. A buffer area between two sections can effectively slow down the rate of decline. It is also designed for guiders and persons who can give some help.



LAND



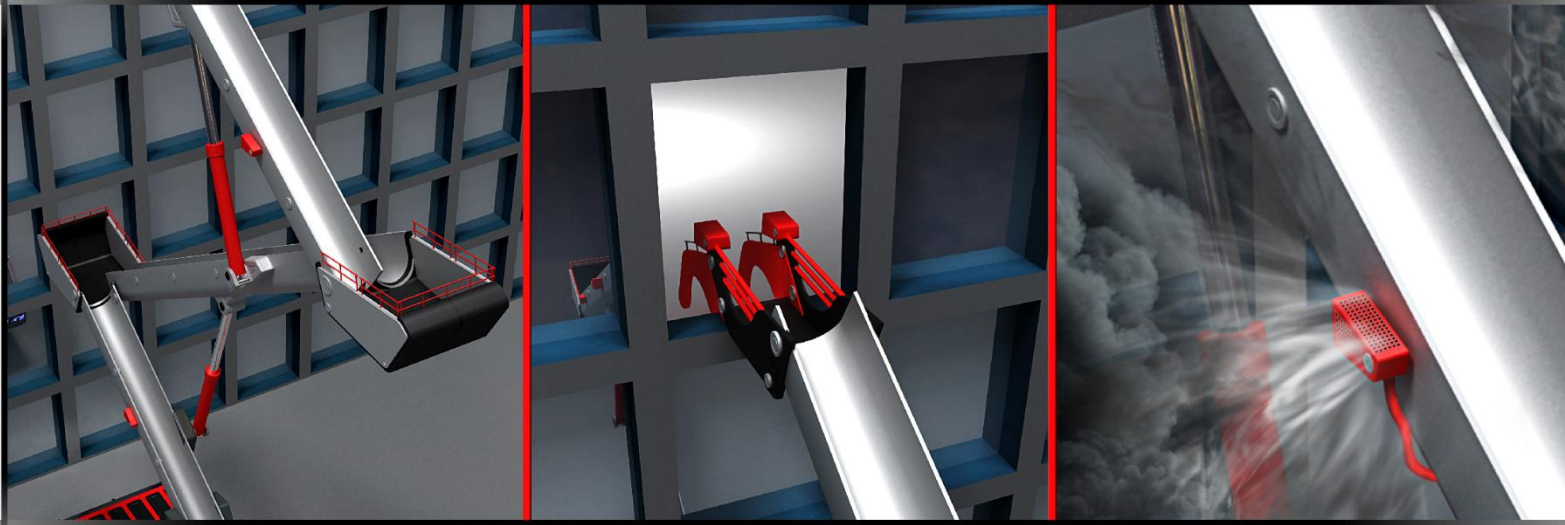
SAFE LANDING

Rescue people and medical person are arranged on the ground to shuttle injured people.



MODEL

LIFE SLIDE
RESCUE CAR



Structure design

The rescue slide are divided into three sections, each reverse cross. A buffer area between two sections can effectively slow down the rate of decline. It is also designed for guiders and persons who can give some help.

Rescue

Two information lights on the connection of slide and building can show the accurate location of rescue place. Top of the slide can break into the window to facilitate people get out.

Protection

Ventilation device on the top can protect people from smoke. Insulation coatings for the aerospace on the surface of slide can resist high temperature of fire.

• 升級開發 - IMPROVE •

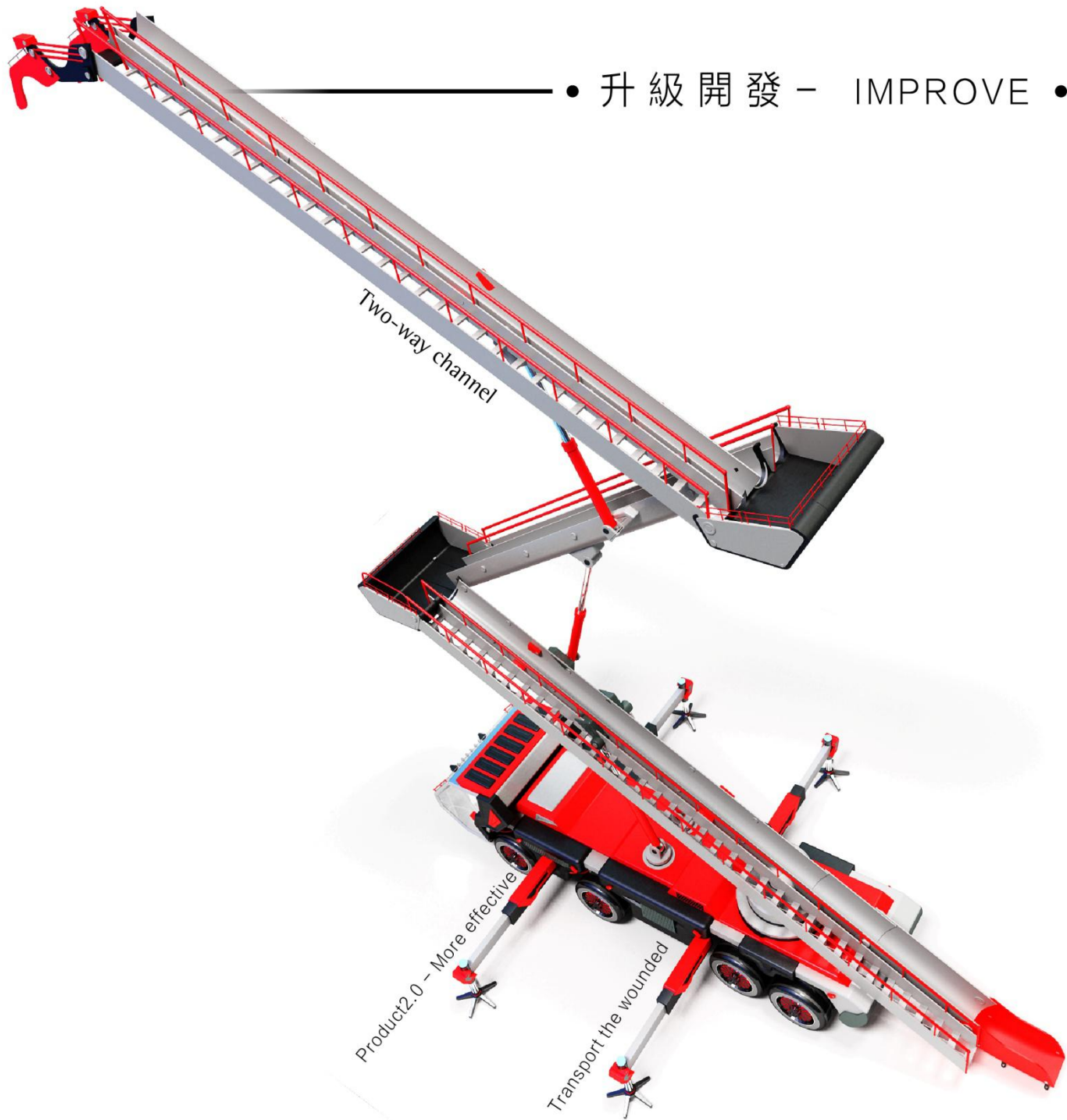


Product1.0



Product2.0

• 升級開發 - IMPROVE •

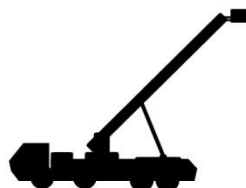


安全通道
SAFE ACCESS

效率對比圖 / Efficiency Comparison Chart



Ladder



At the same time
The number of rescue



Every one needs nearly
20 minutes to be saved

- Slow
- inefficient
- Dangerous



Helicopter



At the same time
The number of rescue



Every one needs nearly
60 minutes to be saved

- Slow
- inefficient
- Dangerous
- Expensive



Manpower



At the same time
The number of rescue

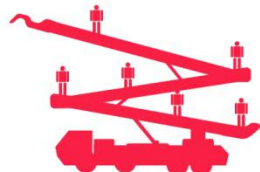


Every one needs nearly
30 minutes to be saved

- Slow
- inefficient
- Dangerous



LIFE SLIDE



At the same time
The number of rescue



Every one needs under
2 minutes to be saved

- Fast
- Efficient
- Safe

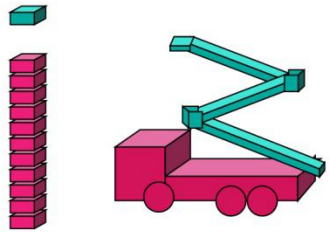
安全係數論證

Demonstrating Safety coefficient

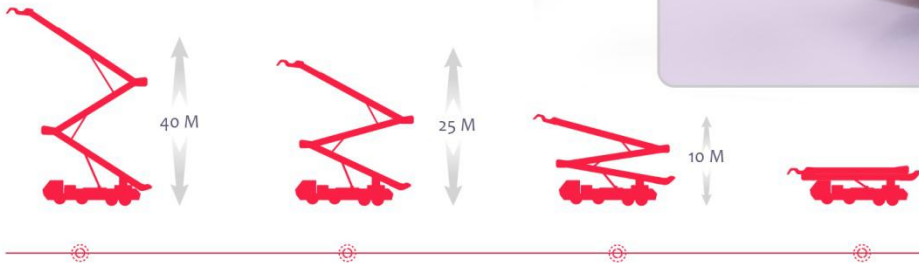
DEMONSTRATING SAFETY COEFFICIENT

1800KG
 滑梯总重量
 THE TOTAL WEIGHT OF THE SLIDE

1:10
 绝对安全比重
 ABSOLUTE SAFETY FOR PROPORTION



20000KG
 车体的总重量
 TOTAL WEIGHT OF CAR BODY



MATERIAL

滑梯采用猛钢材质。主要用于需要承受冲击、挤压、康热磨损等恶劣工况。

500KG

顶层滑梯总量
 THE TOTAL WEIGHT OF THE TOP SLIDE

500KG

一层滑梯总量
 THE FIRST LAYER OF THE TOTAL WEIGHT

400KG

二层滑梯总量
 TWO LAYER OF SLIDE WEIGHT

$100000 \times 0.1N = 10000N (F=P \times S)$
 $0.1 \times 10^4 \times 3 \times 100 = 10000N \approx 1000KG$

抗风10级
 抗震6级

WIND-PROOF FORCE TEN WINDS
 QUAKE-PROOF M 6

1500KG

液压缸的给力为: 1500KG
 HYDRAULIC CYLINDER POWER

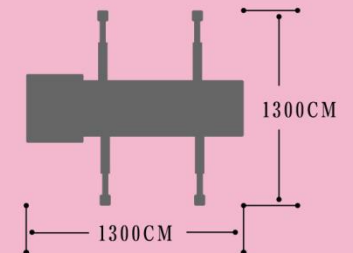
2000KG

液压缸的给力为: 2000KG
 HYDRAULIC CYLINDER POWER

2500KG X 2

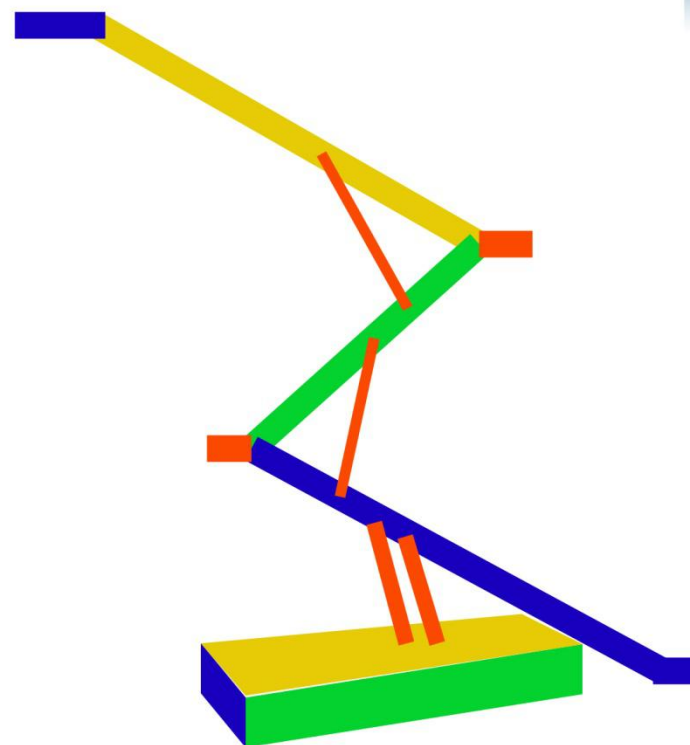
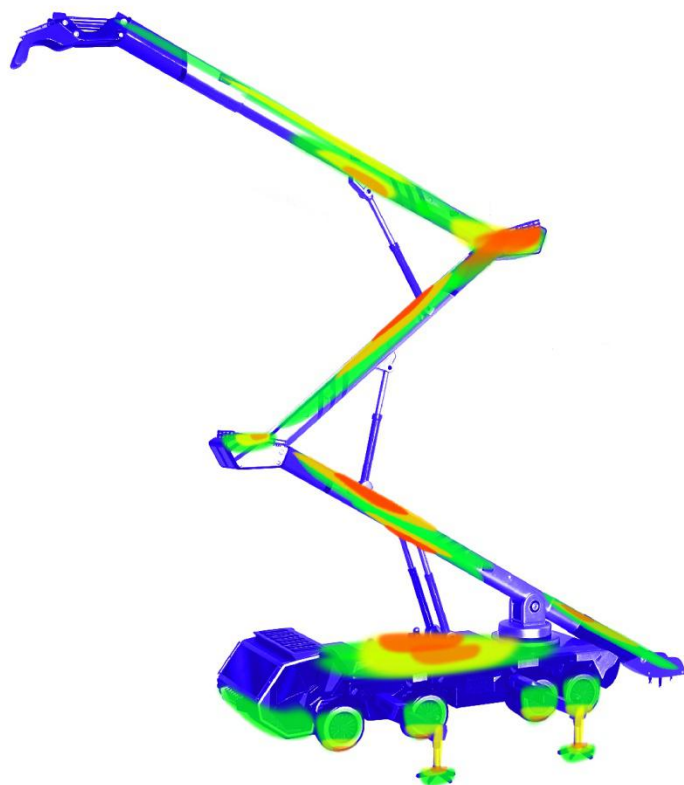
液压缸的给力为: 2500KG X 2
 HYDRAULIC CYLINDER POWER

伸缩支腿 × 4
 400CM × 4
 RETRACTABLE LEG



力學模擬分析-靜力學分析

MECHANICS SIMULATION ANALYSIS - STATIC ANALYSIS



magisso

workbench

建立有限元模型；為了便於分析，將模型進行簡化，使用杆件作為等效替代進行分析。

其中，主杆使用300mm直徑的鋼杆進行等效，液壓缸使用150mm的鋼杆進行等效。

力學仿真分析

MECHANICS ANALYSIS

定義材質屬性 - Define material properties

模型建立后，对其材料属性进行定义，本分析使用常见的**碳素結構鋼Q235A**进行分析，其主要物理性质如下表所示。

表1 Q235A型材物性表 / Table 1 physical properties of Q235A profile

物性 / Properties of Matter	参数 - Parameter
弹性模量(MPa) / Modulus of Elasticity	2.1×10^5
泊松比 / Poisson Ratio	0.3
材料密度 (g.cm ³) / Material Density	7.85
屈服强度(MPa) / Yield Strength	235
许用应力(MPa) / Allowable Stress	113

力學仿真分析

MECHANICS ANALYSIS

程序内设定如下图所示 - PROGRAM SETTINGS AS SHOWN BELOW
 静态分析载荷表 - STATIC ANALYSIS

Toolbox

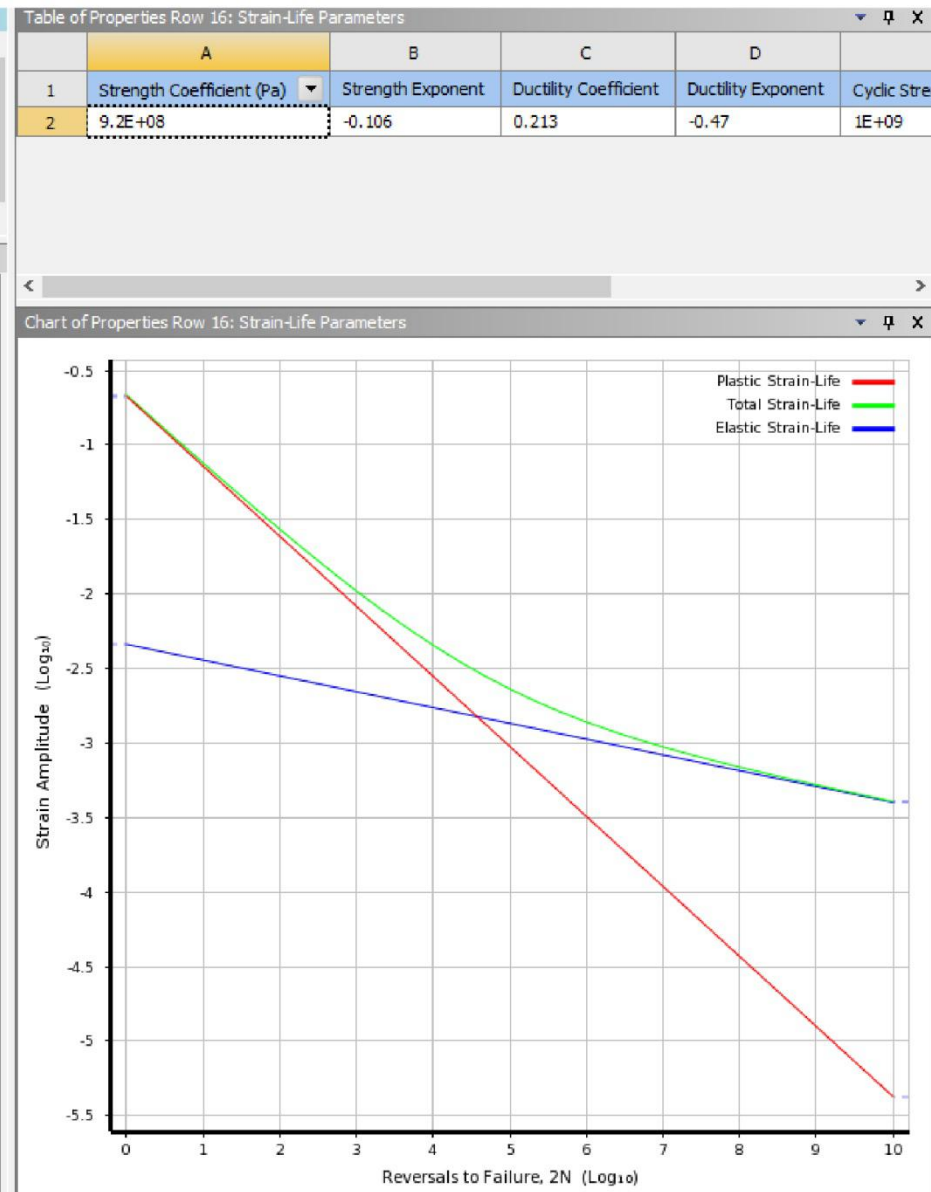
- Physical Properties
- Linear Elastic
- Hyperelastic Experimental Data
- Hyperelastic
- Chaboche Test Data
- Plasticity
- Creep
- Life
- Strength
- Gasket
- Viscoelastic Test Data
- Viscoelastic
- Shape Memory Alloy
- Damage
- Cohesive Zone
- Fracture Criteria

Outline of Schematic A2: Engineering Data

	A	B	C	D
1	Contents of Engineering Data	source		Description
2	Material			
3	Structural Steel			Fatigue Data at zero mean stress comes from 1998 ASME BPV Code, Section 8, Div 2, Table 5-110.1

Properties of Outline Row 3: Structural Steel

	A	B	C	D	E
1	Property	Value	Unit		
2	Density	7850	kg m^-3		
3	Isotropic Secant Coefficient of Thermal Expansion				
4	Coefficient of Thermal Expansion	1.2E-05	C^-1		
5	Reference Temperature	22	C		
6	Isotropic Elasticity				
7	Derive from	Young's Mo...			
8	Young's Modulus	2E+11	Pa		
9	Poisson's Ratio	0.3			
10	Bulk Modulus	1.6667E+11	Pa		
11	Shear Modulus	7.6923E+10	Pa		
12	Alternating Stress Mean Stress	Tabular			
13	Interpolation	Log-Log			
14	Scale	1			
15	Offset	0	Pa		
16	Strain-Life Parameters				
17	Display Curve Type	Strain-Life			
18	Strength Coefficient	9.2E+08	Pa		
19	Strength Exponent	-0.106			
20	Ductility Coefficient	0.213			
21	Ductility Exponent	-0.47			
22	Cyclic Strength Coefficient	1E+09	Pa		
23	Cyclic Strain Hardening Exponent	0.2			
24	Tensile Yield Strength	2.5E+08	Pa		
25	Compressive Yield Strength	2.5E+08	Pa		
26	Tensile Ultimate Strength	4.6E+08	Pa		
27	Compressive Ultimate Strength	0	Pa		



力學仿真分析

MECHANICS ANALYSIS

施加载荷與邊界約束 - APPLIED LOAD AND BOUNDARY CONSTRAINTS

模型的参数设定完成后，对整体机架的受力分析进行简化。

设定主要的受力为自身重力以及三个杆上的均布载荷，具体参数如下表所示。

载荷 / Loads		方向- direction
上方杆均布载荷FA= 4800N	Top	竖直向下Vertical downward
中间杆均布载荷FA= 4800N	Middle	竖直向下Vertical downward
下方杆均布载荷FA= 4800N	Below	竖直向下Vertical downward
自身重力	Self gravity	竖直向下Vertical downward

力學仿真分析 MECHANICS ANALYSIS

载荷添加与划分网格

Load addition and division grid

载荷添加情况如左图所示:

划分网格 Dividing mesh

对模型设定有限元分析的单元类型,

本例中选用四面体单元对模型进行网格划分。

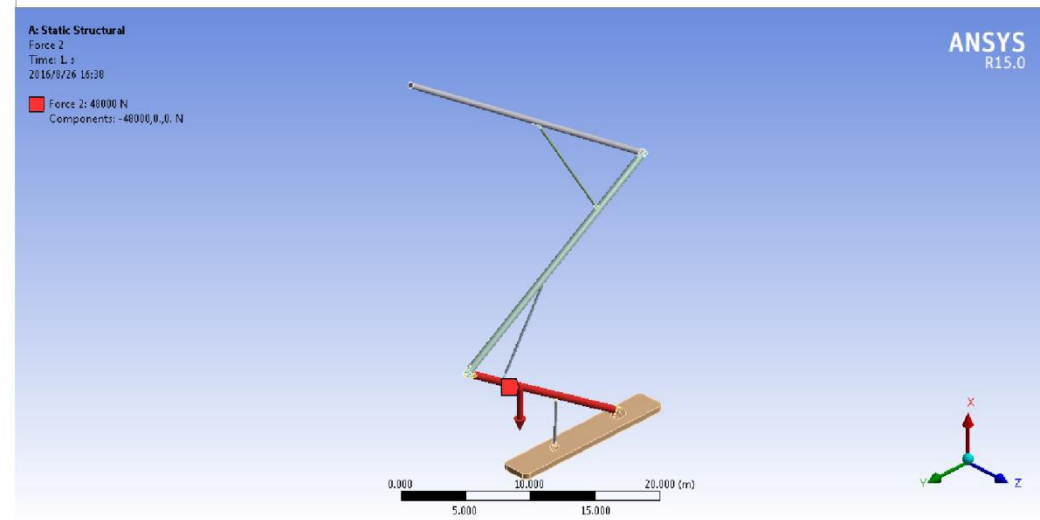
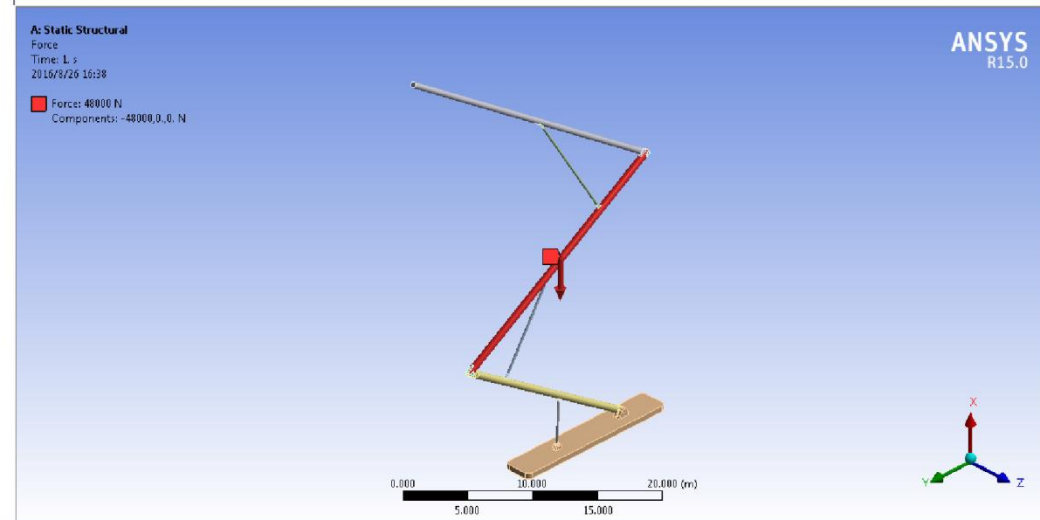
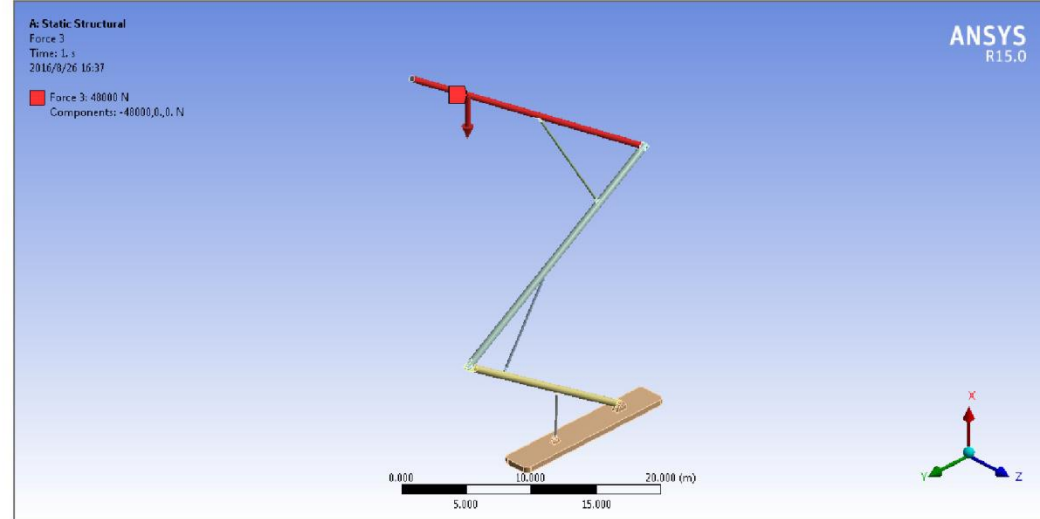
设定求解结果 Set solution results

设定选取等效变形、等效应力为分析结果,

使用ANSYS作为有限元分析平台进行求解, 结果如下表所示。

表3主要分析结果

分析参数	分析结果
整体变形量	Max=0.026613mm; Min=1.7078 × e-6
等效弹性应变	Max=1971.2mm; Min=1968mm
等效应力	Max=15MPa; Min=0.0579

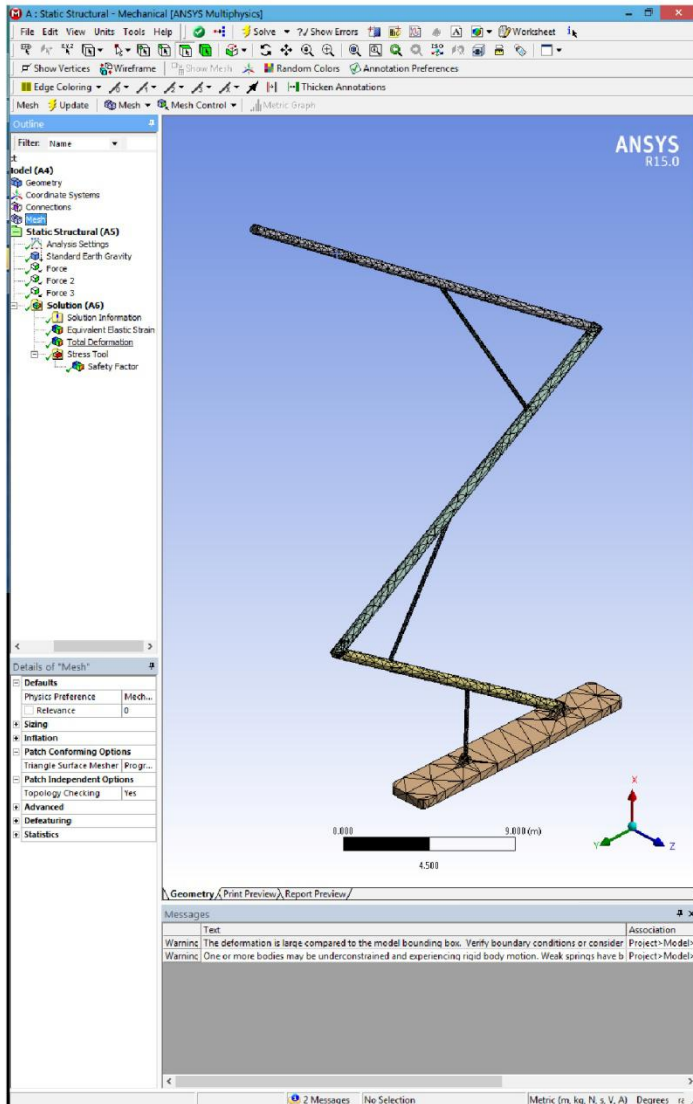


力學仿真分析 MECHANICS ANALYSIS

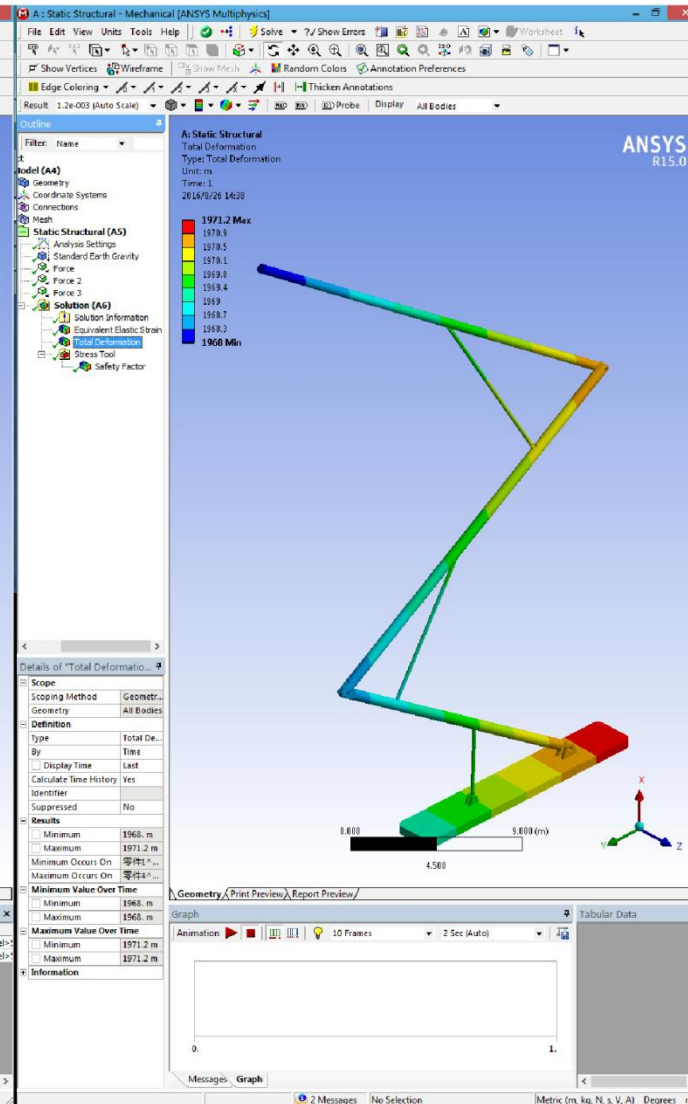
结果分析- Result analysis :

通过简化模型进行定性分析，可得出机架的受力情况定性结论，结论如下：

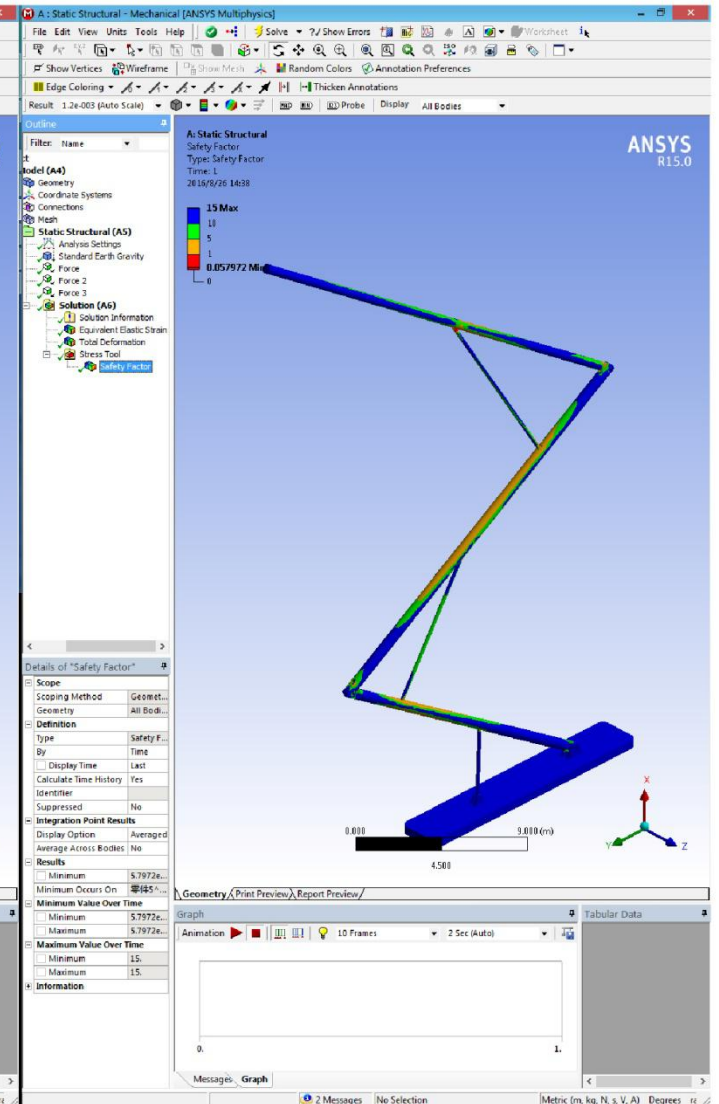
- 1.在杆件范围内，最大应变发生在最高杆与中间杆件的连接处。
- 2.三组液压缸变形较小，相差不大，三个液压缸中最大变形发生最上方液压缸与中间杆的连接部位。
- 3.对承载物（此例中为车辆）而言，主要变形位于下方杆与车身连接的铰链部位。



網格劃分



等效應變

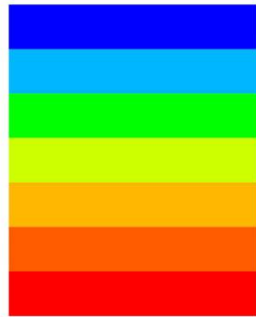


等效應力

力學仿真分析

MECHANICS ANALYSIS

應變度
STRAIN DEGREE



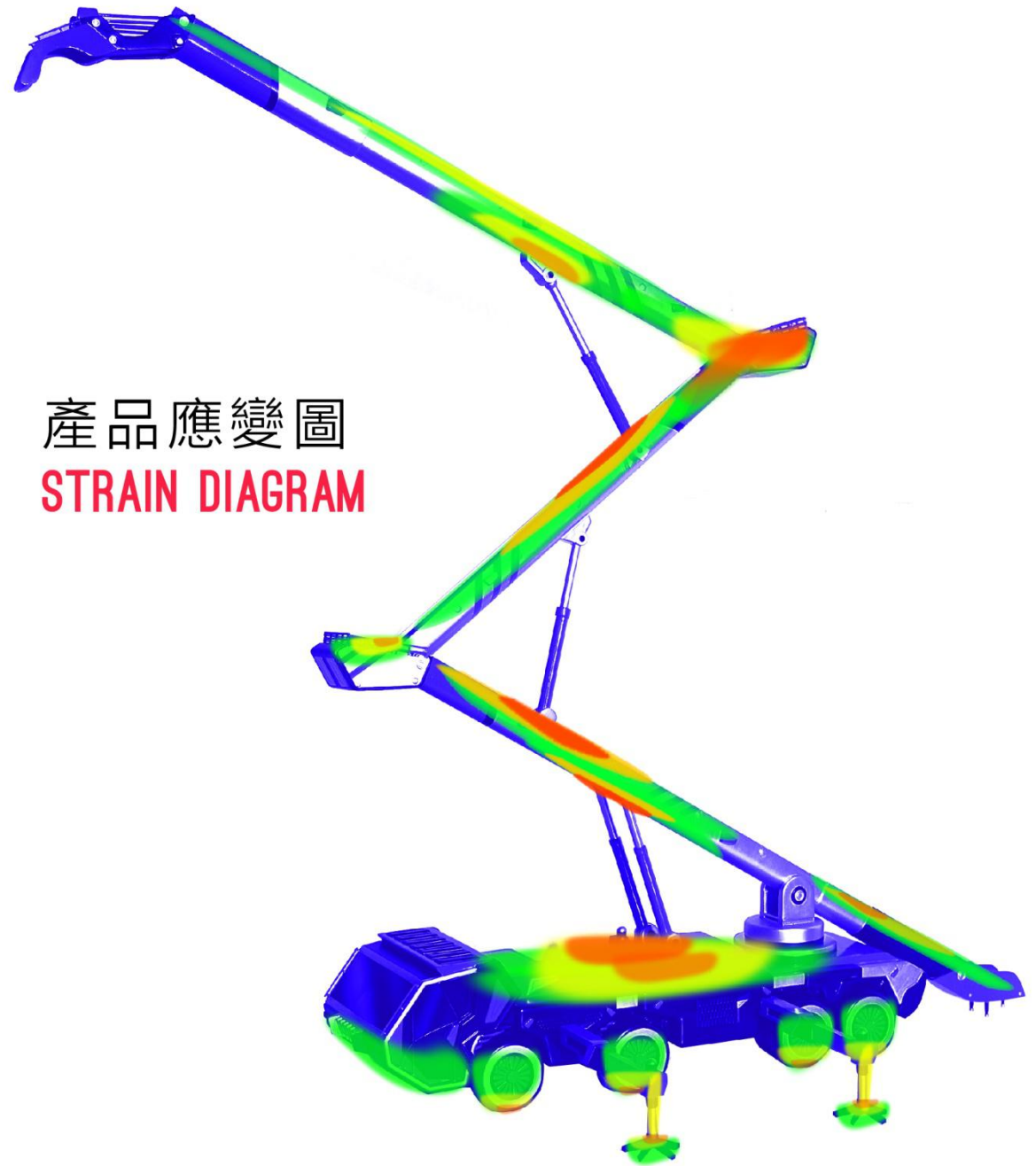
靜力學分析應用

UTILIZE OF STATIC ANALYSIS

- 1, 生產時, 在最大應變發生處 (紅色區域) 加強和加固。如: 多使用鋼材和加厚處理。
- 2, 由於三組液壓缸變形較小, 所以排除了支撐風險。

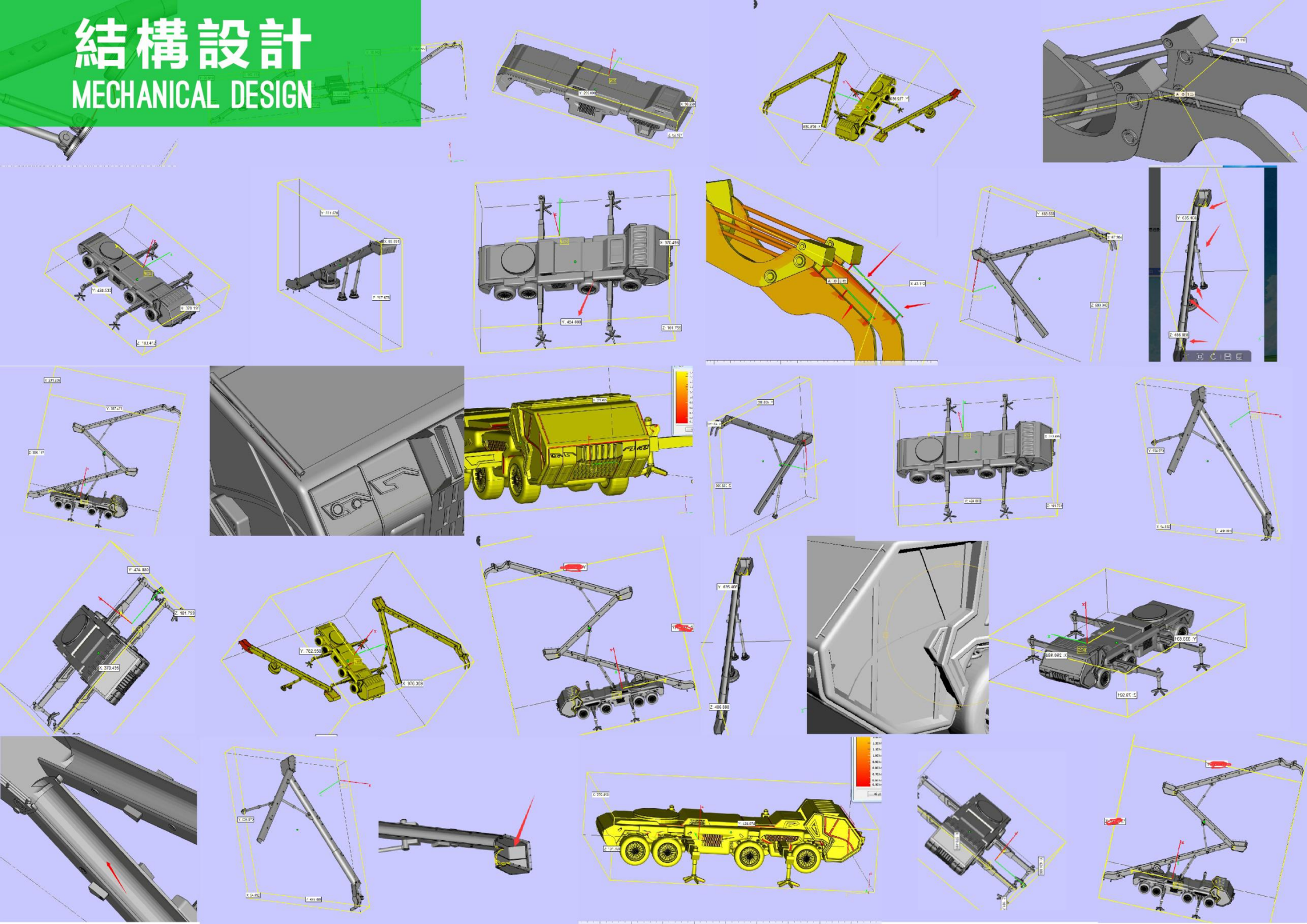
1, at the time of production, at the maximum strain (red region) Strengthening and strengthening. Such as: the use of steel and thickening.

2, because the deformation of the three sets of hydraulic cylinder is smaller, so the risk of support is excluded.

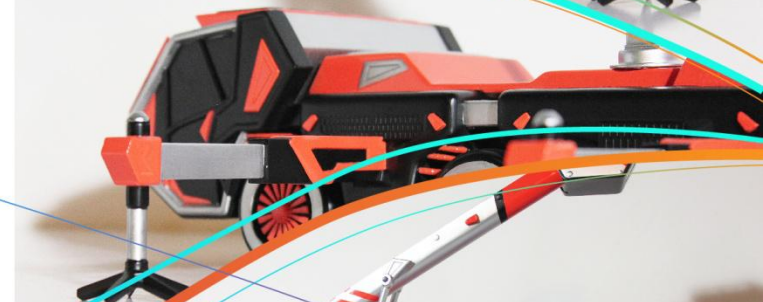


結構設計

MECHANICAL DESIGN















Thanks for Watching

范石钟

FAN. STONE