

## CHAPTER 8

### LAUNCH SITE OPERATION

Launch Site Operation mainly includes:

- LV Checkouts and Processing;
- SC Checkouts and Processing;
- SC and LV Combined Operations.

The typical working flow and requirements of the launch site operation are introduced in this chapter. For different launch missions, the launch site operation will be different, especially for combined operations related to joint efforts from SC and LV sides. Therefore, the combined operations could be performed only if the operation procedures are coordinated and approved by all sides.

LM-2E uses JSLC and XSLC as its launch sites. The launch site operations in the two launch sites are described as follows.

#### **Part A: Launch Operations in JSLC**

Two-stage LM-2E and LM-2E/ETS are launched from in JSLC.

##### **A8.1 LV Checkouts and Processing**

Two-stage LM-2E or LM-2E/ETS launch vehicle is transported from CALT facility (Beijing, China) to JSLC (Gansu Province, China), and undergoes various checkouts and processing in South Technical Center and South Launch Center of JSLC. The typical LV working flow in the launch site is shown in **Figure A8-1**.

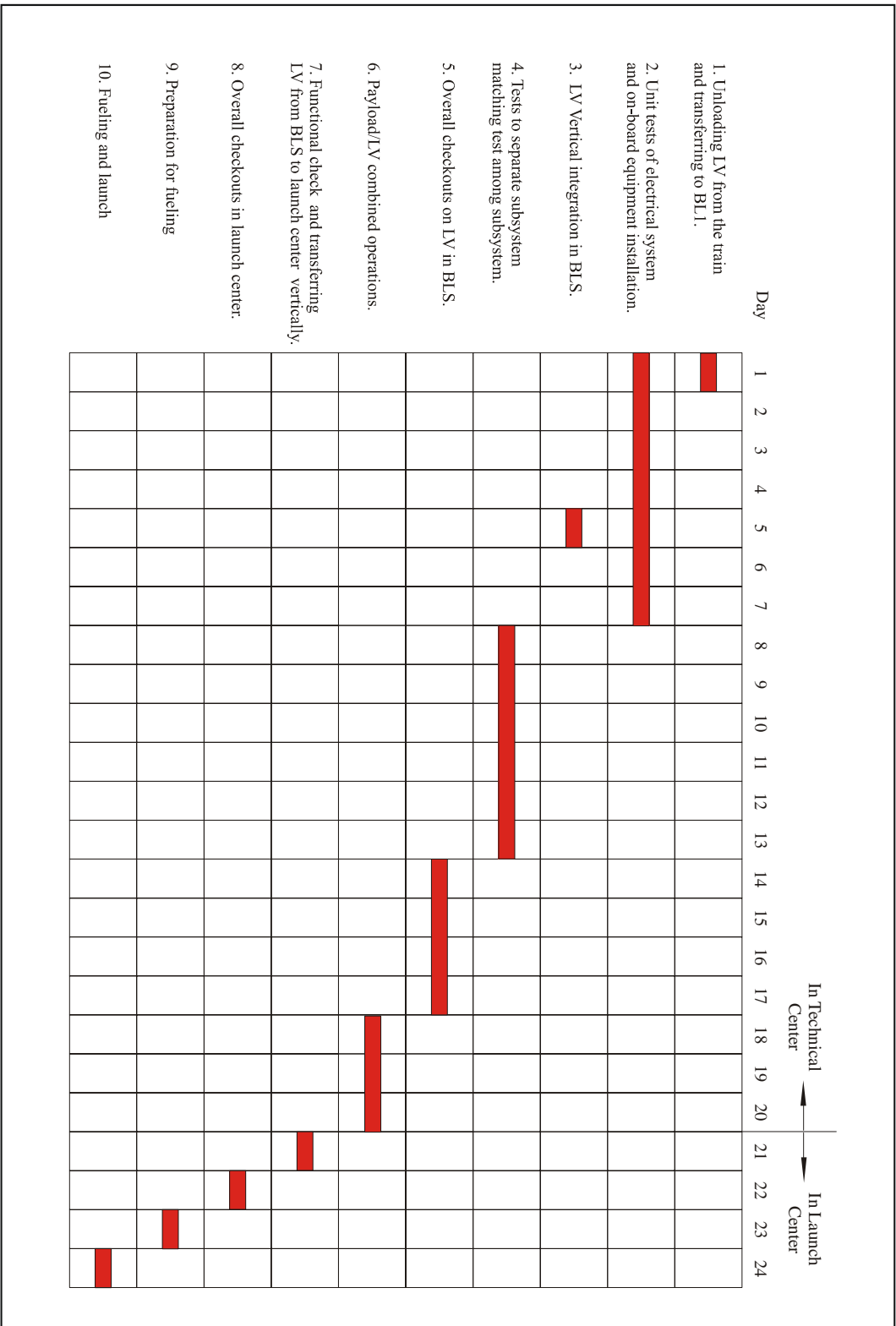


Figure A8-1 LV Working Flow in JSLC

## A8.2 Combined Operation Procedures

Take LM-2E/ETS launching multiple SCs as an example:

### A8.2.1 SC Integration and Fairing Encapsulation in South Technical Center

In BS3, SC team carries out all the SC operations. LV side is responsible for mating SCs with dispenser and installing SC separation devices. The following describes the typical working procedure:

1. CALT to bolt the dispenser on the supporting table;
2. SC team to lift up SCs, and CALT to mate them with dispenser one by one and install SC/LV separation devices;
3. CALT to complete the SC/LV integration and form a SC/Dispenser stack;
4. CALT to mate OMS with payload adapter in BLS and to transfer the OMS/Adapter stack from BLS to BS3; CALT to set up the fairing encapsulation pad in BS3.
5. CALT to bolt the OMS/Adapter stack on the fairing encapsulation pad;
6. CALT to integrate the SC/Dispenser stack with OMS/Adapter stack.

See **Figure A8-2**.

7. CALT to encapsulate the fairing in BS3;
8. CALT to remove the fairing fixture, and to install the hoisting basket;

See **Figure A8-3**.

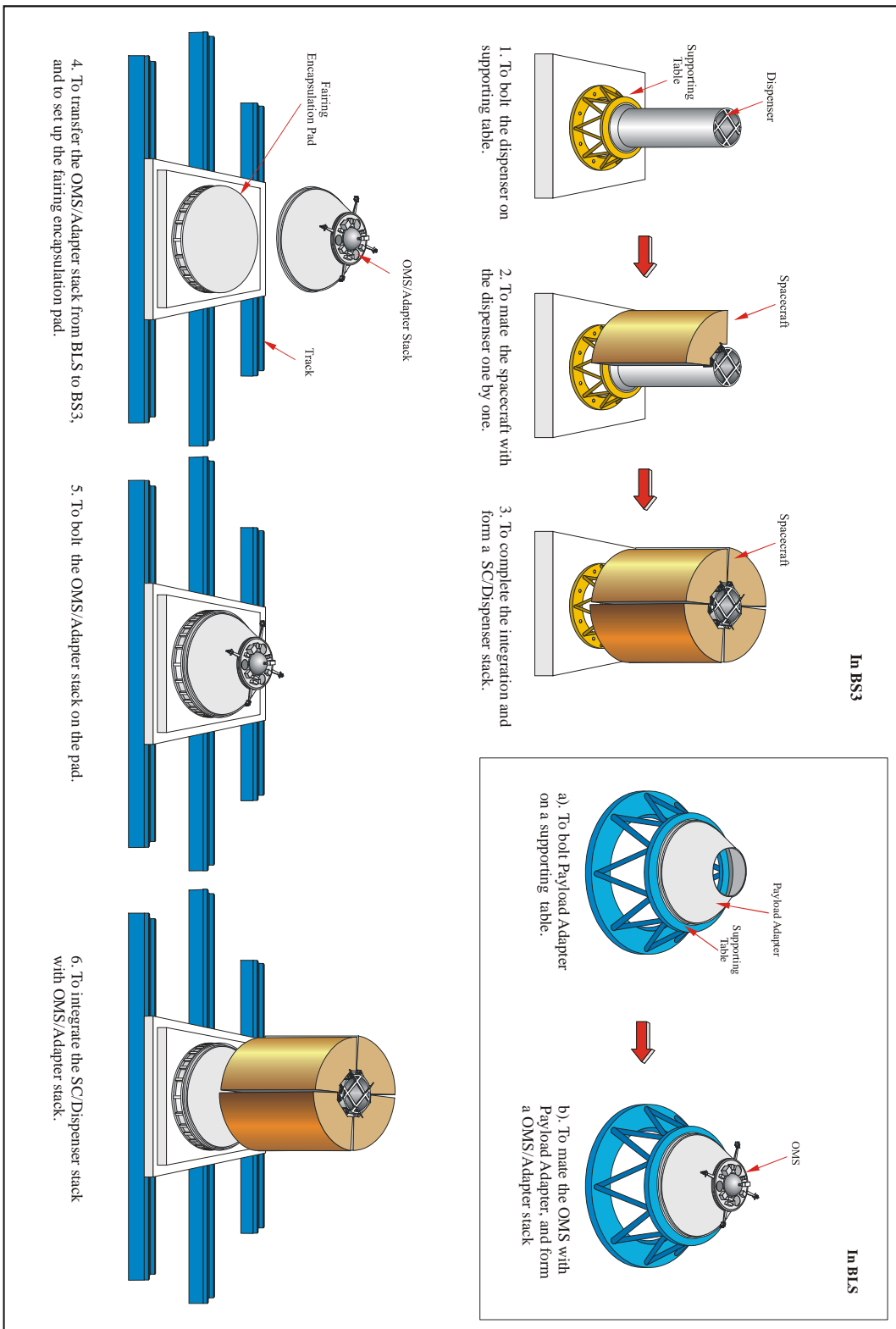


Figure A8-2 Payload/LV Integration

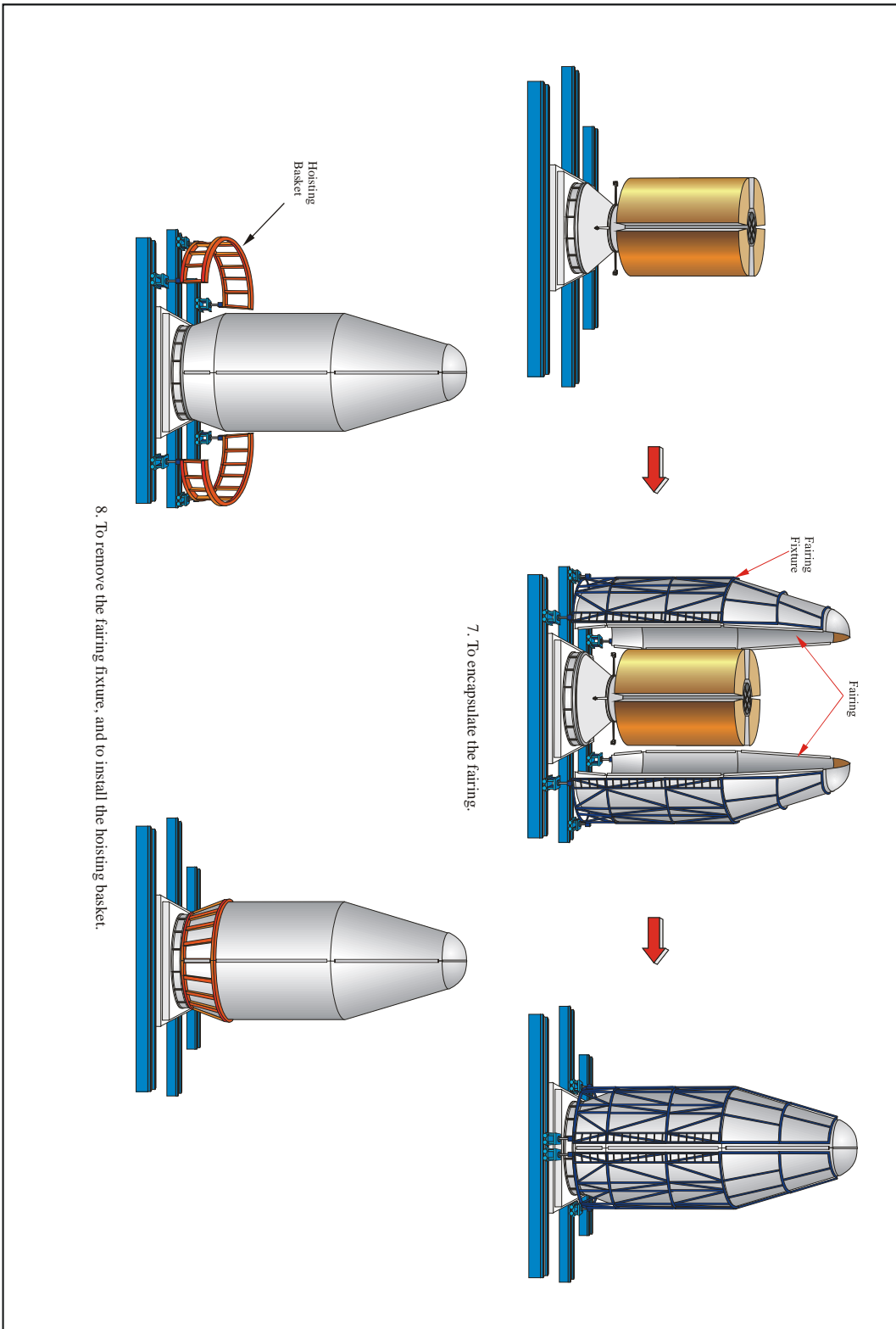


Figure A8-3 Fairing Encapsulation in BS3

### A8.2.2 SC Transfer and Fairing/Stage-2 Integration

CLTC is responsible for transferring the encapsulated fairing from BS3 to BLS. The following working procedures are performed:

9. CLTC to lift the encapsulated fairing onto the transfer vehicle and to fasten the fairing with ropes; CLTC to drive the vehicle from BS3 to BLS;
10. CLTC to release the encapsulated fairing from the transfer vehicle; CLTC to install hoisting slings to the encapsulated fairing inside BLS;
11. CLTC to lift the fairing onto the second stage of LM-2E, which is already erected;
12. CALT to mate the encapsulated fairing with stage-2 of LM-2E. This is the end of the combined operations.

See **Figure A8-4**.

After the above-mentioned combined operation is all over, LM-2E carrying SCs will undergo various functional checkouts inside BLS, then it will be transferred to launch center by moveable launch pad.

### A8.3 SC Preparation and Checkouts

- CALT and CLTC are responsible for checking and verifying the umbilical cables and RF links. If necessary, SC team could witness the operation.
- LV accessibility and RF silence time restriction must be considered, when SC team performs operation to SCs.

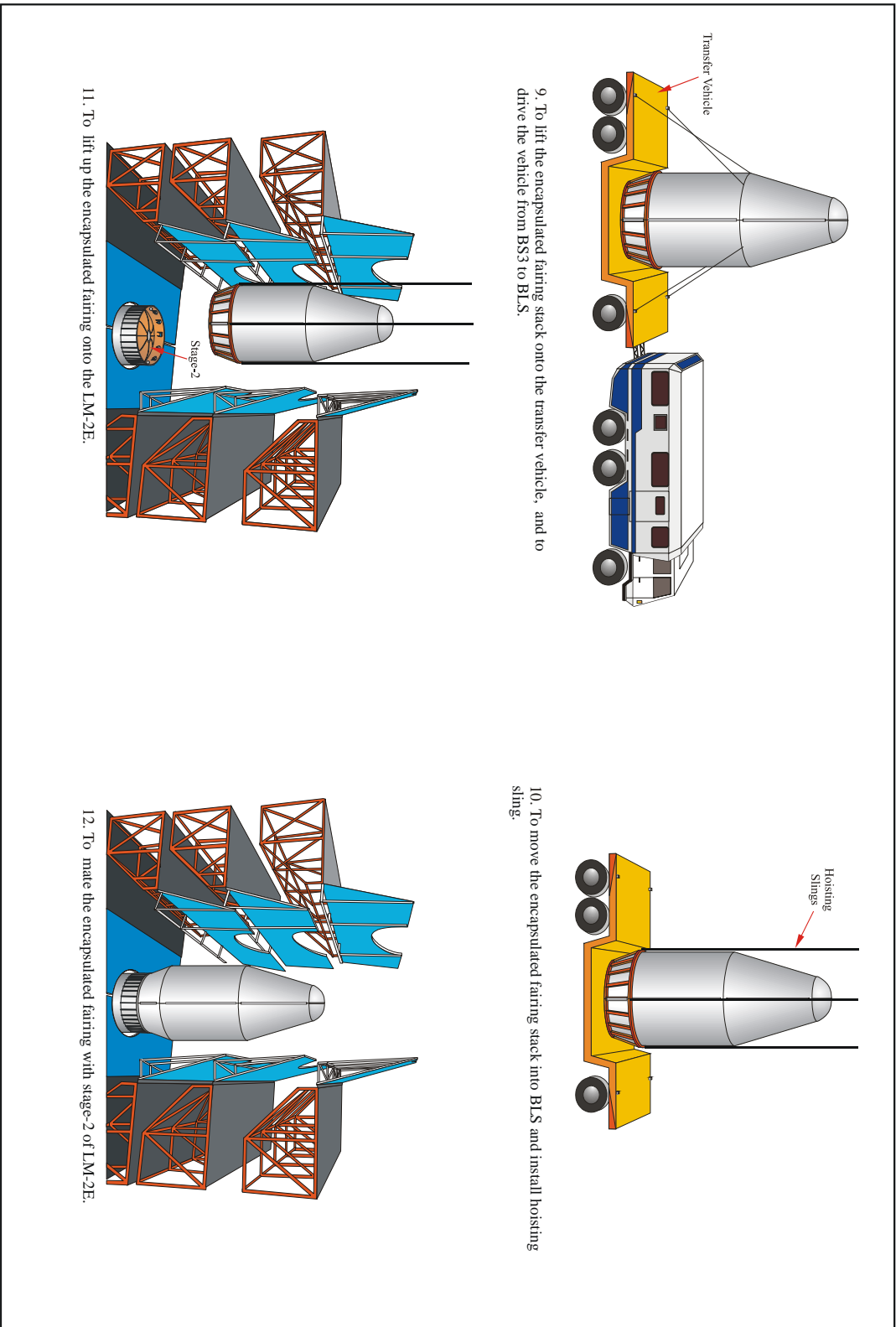


Figure A8-4 Payload Transfer and Fairing/stage-2 integration

## A8.4 Launch Limitation

### A8.4.1 Weather Limitation

- Ambient temperature:  $-10^{\circ}\text{C}\sim+40^{\circ}\text{C}$ ;
- Relative humidity:  $\leq 98\%$  (corresponding to  $20\pm 5^{\circ}\text{C}$ )
- The average ground wind velocity in the launch area is lower than 10m/s
- The winds aloft limitation:  $q\times\alpha\leq 3400\text{N/m}^2\cdot\text{rad}$  ( $q\times\alpha$  reflects the aerodynamic loads acting on the LV, whereas,  $q$  is the dynamic head, and  $\alpha$  is LV angle of attack.)
- The horizontal visibility in the launch area is farther than 20km.
- No thunder and lightning in the range of 40km around the launch area, the atmosphere electrical field strength is weaker than 10kV/m.

### A8.4.2 "GO" Criteria for Launch

- The SCs' status is normal, and ready for launch.
- The launch vehicle is normal, and ready for launch.
- All the ground support equipment is ready;
- All the people withdraw to the safe area.

## A8.5 Pre-launch Countdown Procedure

The typical pre-launch countdown procedure in the launch day is listed below:

No.	Time	Event
1	-6 hours	Preliminary Calculation by Flight Software
2	-5 hours	Functional Checkouts on Each Sub-system
3	-4 hours	GSE Withdrawal, LV Status Checkouts, Sealing
4	-2 hours	Preparing to Move Back the Service Tower
5	-80 minutes	Moving Back the Service Tower; Accurately aiming; Ground Telemetry and Tracking Systems Power-on;
6	-60 minutes	Preliminarily Loading Flight Software; Loading PUS Software;
7	-50 minutes	Tank Pressurization
8	-40 minutes	Gas Pipes and Air-conditioning Pipes Drop-off; Flight Software Loading; SC Power Switch-over;



		On-board Telemetry and Tracking Systems Power-on
9	-5 minutes	Telemetry, Tracking and Propellant Utilization Systems Power Switch-over;
10	-60 seconds	Control System Power Switch-over; Control System, Telemetry System and Tracking System Umbilical Disconnection; Moving Back the Cable Swing Arms;
11	-30 seconds	TT&C Systems Starting;
12	-7 seconds	Camera on;
13	0 seconds	Ignition.

### A8.6 Post-launch Activities

The orbital parameters of the injected orbit will be provided to Customer in half-hours after SC injection.

The launch evaluation report will be provided to the Customer in a month after launch.

## Part B: Launch Operations in XSLC

Two-stage LM-2E and LM-2E/EPKM are launched from XSLC.

### B8.1 LV Checkouts and Processing

The launch vehicle is transported from CALT facility (Beijing, China) to XSLC (Sichuan Province, China), and undergoes various checkouts and processing in Technical Center and Launch Center of XSLC. The typical LV working flow in the launch site is shown in **Table 8-1**.

**Table 8-1 LV Working Flow in the Launch Site**

	No.	Item	Working Period	Accumulative Period
T E C H N I C A L	1	To Unload LV from the Train and Transfer LV to BL1.	1 day	1 day
	2	Unit Tests of Electrical System	7 days	8 days
	3	Tests to Separate Subsystems	3 days	11 days
	4	Matching Test Among Subsystems	4 days	15 days
	5	Three Overall Checkouts	4 days	19 days
	6	Review on Checkout Results	1 day	20 days
	7	LV Status Recovery before Transfer	2 days	22 days
	8	To Transfer LV to Launch Center	1 days	23 days
L A U N C H C E N T E R	9	Erecting LV on the Launch Pad	2 days	25 days
	10	Tests to Separate Subsystems	3 days	28 days
	11	Matching Test Among Subsystems	3 days	31 days
	12	The first and second overall checkouts	2 days	33 days
	13	To Transfer SC/Fairing Stack to Launch Center	1 days	34 days
	14	EMC Testing	1 days	35 days
	15	The Third Overall Checkout (SC Involved)	1 day	36 days
	16	The Fourth Overall Checkout	1 day	37 days
	17	Review on Checkout Results	1 day	38 days
	18	Functional Check before Fueling, Gas Replacement of Tanks	2 days	40 days
	19	N <sub>2</sub> O <sub>4</sub> /UDMH Fueling Preparation	1 days	41 days
	20	N <sub>2</sub> O <sub>4</sub> /UDMH Fueling	0.5 day	41.5 days
	21	Launch	0.5 days	42 days
Total			42 days	42 days

After the SC is transferred to Launch Center, some of SC and LV operations can be performed in parallel under conditions of no interference.

## **B8.2 Combined Operation Procedures**

Take LM-2E/EPKM launching GTO satellite as an example.

### **B8.2.1 SC Integration and Fairing Encapsulation in Technical Center**

In BS3, SC team carries out all the SC operations. CALT is responsible for mating SC with EPKM and installing the separation devices. The following describes the working procedure:

1. CALT to bolt the LV adapter on the fairing encapsulation pad;
2. CALT to mate the interface adapter with LV adapter, and install clampband system;
3. CALT to bolt EPKM with interface adapter;
4. SC team to install SC adapter on the SC;
5. SC team to lift up SC and move SC onto the EPKM;
6. CALT to bolt SC adapter with EPKM;
7. CALT to encapsulate the fairing in BS3;
8. CALT to remove the fairing fixture, and to install the hoisting basket;

### **B8.2.2 SC Transfer**

CLTC is responsible for transferring the encapsulated fairing from BS3 to Launch Center.

The following working procedures are performed:

9. CLTC to lift the encapsulated fairing onto the special vehicle and to fasten the fairing with ropes; CLTC to connect the air-conditioning to the fairing if necessary; CLTC to drive the vehicle from BS3 to Launch Service Tower;
10. CLTC to release the encapsulated fairing from the transfer vehicle; CLTC to install slings to the encapsulated fairing under the Launch Service Tower; CLTC to lift the fairing onto the 8<sup>th</sup> floor of the tower;

### B8.2.3 SC/LV Integration in Launch Center

The encapsulated fairing will be mated with the LV second stage on the service tower.

The following working procedures are performed:

11. CALT to hoist the encapsulated fairing above the LV second stage;
12. CALT to joint the bottom of the fairing with LV second stage; CLTC to remove the hoisting basket outside the fairing; CLTC to connect the SC umbilical connectors and SC air-conditioning.

### B8.3 SC Preparation and Checkouts

- CALT and CLTC are responsible for checking and verifying the umbilical cables and RF links. If necessary, SC team could witness the operation.
- LV accessibility and RF silence time restriction must be considered, when SC team performs operation to SC.

### B8.4 Launch Limitation

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