



# HOT AIR BALLOON FLIGHT MANUAL

Aerostar (Raven) Model RX-8 Hot Air Balloon

Type Certificate No. A15CE

Λ  $\cap$  $\cap$ m h FAA Approved: Donald P. Michal, Manager Chicago Aircraft Certification Office FAA Central Region

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# AEROSTAR HOT AIR BALLOON EQUIPMENT LIST

The following items must be carried as required equipment:

**INSTRUMENTS** 

- 1. Sensitive altimeter.
- 2. Approved envelope temperature indicator.
- 3. Rate-of-climb indicator.
- 4. Fuel quantity gauge(s).

BURNER RELIGHTERS (minimum two): ignitor/strikers.

→><u>HELMETS</u> for all occupants.

FAA APPROVED BALLOON FLIGHT MANUAL.

AIRWORTHINESS CERTIFICATE.

VALID REGISTRATION CERTIFICATE.

The following items are recommended to be carried as additional safety equipment:

LEATHER GLOVES

FIRE RETARDANT CLOTHING

DROP LINE (Suggest 150 foot length and 3000 lb. breaking strength)

FIRE EXTINGUISHER (Suggest 2 1/2 lb. 1-A, 10-B:C or higher)

TOOL POUCH

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# **GENERAL WARNINGS AND CAUTIONS**

#### WARNING

Failure to comply with these cautions and warnings or those that follow throughout this manual may result in severe personal injury or death.

Power Lines represent a major source of danger in ballooning. These dangers cannot be overstated and must be treated with the greatest respect at all times. Some of the consequences of inadvertent power line contact include: 1. fire, 2. electrocution, 3. ruptures of the fuel system, 4. cutting of load cables, 5. severe damage to fabric. Each of these dangers or damage represents immediate life threatening situations and must be avoided.

FAA licensed pilots only may serve as pilot in command. The pilot in command is responsible for the safe and proper conduct of all phases of flight. He or she must make the final decision on weather conditions, launch sight hazards, aircraft airworthiness, the execution of correct emergency procedues, the proper course of action when in extremis, control and safety of passengers, and landing site selection as well as any other situation which might effect the safe conclusion of flight. The pilot in command must have read this manual and thoroughly understand it as well as all applicable FARs.

LP gas or propane is a highly volatile fuel and as such must be treated with a great deal of respect at all times. Liquid petroleum gas of which propane is the most common constituent, is heavier than air and as such tends to collect in low areas and pose a great danger of explosion. Similarly, any leak may be ignited by an ignition source at several feet distance. It is imperative that the potential for leaks be minimized, and when they occur, rapid and positive action must be taken to prevent a dangerous and possibly uncontrollable fire.

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1.4 **FUEL** 

Liquid propane or commercial LPG must be used. Avoid mixtures containing small amounts of butane in cold weather and large amounts of butane at all times. At 100 F, butane produces vapor pressures of less than 40 psi.

80 to 160 psi is the normal range of fuel pressure for flight. Care should be exercised in the marginal 60 to 80 psi range and flight should not be attempted below 60 psi. Burner output varies directly with fuel pressure and will provide insufficient output to effectively control the balloon below 60 psi. Burner output varies directly with fuel pressure and will provide insufficient output to effectively control the balloon below 60 psi. Pressures in excess of 160 psi may produce inefficient heat exchange and burning as well as excessive flame beint which may cause damage to the balloon top flame height which may cause damage to the balloon top.

Quantity must be determined prior to flight. This may be done by the methods described in Section VI, Servicing. For upright 10, 15, 18 and 23 gallon tanks, 4, 9.7, 9.9 and 10.6 gallons respectively must be used for planning if the gauge reads 32%, 65%, 55% or 45%, respectively, and quantity has not been determined using the fixed liquid level gauge or by weighing.

## 1.5 PROTECTION EQUIPMENT

Helmets are required for all occupants on board and must be worn during emergency procedures as specified in Section 3 of this manual as well as any other time it is deemed necessary by the pilot-in-command. It is recommended that the minimum guideline for such utilization be:

- Optional for take-offs and landings in winds of less than 10 mph. 1.
- 2. Utilize for all take-offs and landings in winds of 10 mph or
- greater. Utilize for low altitude flight including take-offs and 3. landings when wind conditions are gusty or unstable. V

It is strongly recommended that helmets be worn for the above conditions as a minimum. The final determination on such utilization remains with the pilot-in-command and he must apply these guidelines based on experience and each individual situation as it arises. Passengers must be briefed on their proper use prior to flight.

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Leather gloves and fire retardant clothing are optional but recommended.

#### **1.6 FLIGHT LIMITATIONS**

Day or night flight under visual flight rules only is approved provided the aircraft is equipped with required equipment and is in operating condition as specified under Parts 91 and 31 of Federal Aviation Regulations. Flight during instrument meteorological conditions (IMC) must not be attempted. See Appendix II for chart of VFR cloud avoidance and visibility requirements.

#### 1.7 TETHERING

Tether lines shall not be attached to the basket or support structures. When tethering the balloon, tether lines must be attached to the load fittings at the interface between gondola and envelope (and top tether/top ring if installed).

#### 1.8 FUELING

Wicker baskets which have been lined or polyethylene baskets which do not ventilate through the basket walls ---walls must not be fueled with tanks inside basket.

#### WARNING

Do not refuel tanks while in a polyethylene or lined wicker basket.

#### 1.9 LOG BOOK ENTRIES

All time during which the balloon is inflated and buoyant/upright (including tether operation) must be recorded in the envelope log book.

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# 1.10 BURNER SKIRT

Burner skirt must be used during all flights. This ensures proper and reliable burner operation. See Chart 1-1 to determine proper skirt for each burner.

#### 1.11 DEFLATION SYSTEM

4 Seconds is the maximum time span the parachute top may be actuated except for the purpose of landing as outlined in Normal Procedures, Section 2, and Emergency Procedures, Section 3, for emergency/hard and high wind landings, onboard fires and obstacle avoidance. This time is based on a pull of 30-36 inches on the actuation line. If the line should be pulled further than this, the time must be shortened. The envelope must be allowed to reinflate between top actuations.

At 500 feet per minute rate-of-descent and greater, parachute actuation must not be attempted. This may produce excessively high rates of descent which may make a timely recovery difficult.

### 1.12 DISASSEMBLY AND ASSEMBLY

Disassembly and assembly of envelope, basket, and burner, if performed as necessary for flight or transport, must be performed in accordance with Sections 2.2 and 2.8.

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## II. NORMAL PROCEDURES

# 2.1 PREFLIGHT PLANNING

- 2.11 Weather Brief Obtain current weather conditions and forecast to verify that conditions are suitable for flight. Weather information should be obtained no more than 3 hours prior to flight (See Appendix I). A final weather  $\checkmark$  evaluation should be made just prior to launch to ensure that existing conditions are still suitable for flight.
- 2.12 Loading Check loading. Allow a margin of available lift for vertical maneuvering expected during flight. Bear in mind that if the balloon is loaded to require 250 F envelope temperature for equilibrium at the desired flight altitude, the balloon cannot climb without increasing envelope temperature and encroaching on the time limited 250-275 F range.
- 2.13 <u>Launch Site</u> Select a launch site based on wind conditions where clearance of obstacles downwind will create no problem.

#### WARNING

Ensure there are no power lines in the area!!

For power lines or similar hazardous obstacles downwind of the launch site, allow at least 100 feet horizontal separation between the obstacle and balloon for each mph of wind speed at obstacle height. This applies to obstacles up to 50 feet in height. Larger obstacles will require greater separation distances. This guideline will vary with pilot experience, loading, and gust conditions for each instance. The pilot-in-command is responsible for safe placement.

2.14 <u>Fuel Planning</u> - Determine the amount of fuel in each tank by one of the following methods:

1. Fixed liquid level gauge (see Section 6.22).

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\* Blast Valve - moves smoothly, closes when released.

# NOTE

Stiff or sticky action of blast valve requires maintenance prior to flight.

#### WARNING

Stiff or sticky action may indicate lack of "O" ring lubricant which may cause failure and hazardous propane leakage.

\* Pilot/Metering Valves - opens and closes smoothly.

Fuel tank valve open.

#### NOTE

Ensure that the area toward which the burner is pointed is free of crew members and equipment, and the envelope will not be burned by an inadvertent flame.

• Tank Valves - proper operation, no leaks.

Hoses - no leaks.

## NOTE

Possible leakage may be detected by the sound or smell of propane escaping from valves, fuel lines, or tanks, frosting, or a cloud of vapor.

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# 2.52 Burner and Tanks

- Check burner valves for proper operation.
- \* Pilot light remains lit after burning.
- Check ability to draw fuel from each tank.
- Check fuel pressure on each tank.

# 2.53 Instruments

• Altimeter Set.

• Rate-of-Climb (vertical speed indicator) indicating zero.

• Pyrometer - indicating temperature reasonable for conditions.

## NOTE

If instruments are not functioning properly, discontinue flight.

# NOTE

Note temperature when neutral buoyancy is achieved to ensure that temperature is reasonable for load carried. (See Section IV, Performance, to determine temperature vs. load).

# 2.54 Recheck Equipment

- \* Strikers 2 minimum
- Helmets for each passenger.
- Tools, gloves, drop line, fire extinguisher . . .
- \* Balloon flight manual.
- \* Airworthiness Certificate.
- \* Valid registration certificate.
- 1.55 Passengers

\* Briefed on normal and emergency procedures, duties, and flight profile.

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If fire is uncontrollable:

3. Effect rate-of-descent for immediate landing by venting or opening deflation panel.

## WARNING

In serious emergencies, the most important action is to get on the ground. Either the maneuvering vent or the deflation panel can be used for quickdescent, however, long venting or opening of the deflation panel will cause high rates of altitude loss and must only be executed in extreme situations. At altitudes above 100 ft. AGL, use venting action to initiate descent to keep envelope from collapsing.

4. Prepare for emergency/hard landing as necessary (see Section 3.29).

3.28 Dangerous Obstacle Avoidance

In the event of an extreme situation where there is an imminent threat of impact with dangerous obstacles which ma cause serious or fatal injuries:

1. Effect rate-of-descent for immediate landing by venting or opening deflation panel.

## WARNING

Long venting or opening of the deflation panel will cause high rates of altitude loss and must only be executed in extreme situations. At altitudes above 100 feet AGL, use venting action to initiate descent to keep envelope from collapsing.

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## 5.11 Parachute Top Design

The parachute top design employs a parachute style panel covering the deflation port opening. Cords spaced equally around the circumference of the panel and fastened to the envelope wall serve to anchor and center the parachute style panel in the deflation port opening. Another set of cords extend from the edge of the parachute to a point below the center of the panel and are attached to a single actuation line. This line extends down to the basket to provide the pilot a means of controlling the top. Venting can be accomplished by pulling on the actuation line for short periods of time. When the line is released, internal envelope pressures will return the parachute to its position covering the port. Deflation is accomplished by pulling on the actuation line, thereby separating the parachute from the edges of the deflation port and allowing the hot air to escape from the envelope.

#### CAUTION

The parachute top provides a very powerful venting action and for this reason, except for landind, the parachute top must not be held open for longer than four seconds in any one actuation period. Otherwise, partial or total deflation of the envelope may occur.



Fig. 5-1 5-2b