FIREFLY BALLOONS, INC.

810 SALISBURY ROAD

STATESVILLE, NC 28677

FAA - APPROVED
BALLOON FLIGHT MANUAL
for
THE GALAXY 7 BALLOON

NOMINAL VOLUME: 77,200 CUBIC FEET

Registration No.

Serial No.

THIS FLIGHT MANUAL MUST BE CARRIED IN THE BALLOON
DURING EACH FLIGHT

FAA APPROVED:
for
Manager, Aircraft Certification Office,
Federal Aviation Administration,
Atlanta, Georgia

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LOG OF REVISIONS

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A	All 2-1	Retyped 2.5.1 Burner 2.5.4 Tanks	for Manager, Aircraft Certification Office, Federal Aviation Administration, Atlanta, Georgia DATE: JUNE 11, 1993
B	All	Name change to Firefly Balloons	for Manager, Aircraft Certification Office, Federal Aviation Administration, Atlanta, Georgia Date: 3/1/01

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1. GENERAL

1.1 INTRODUCTION

This manual is furnished to provide information on this balloon and its proper operation. The balloon is carefully designed and built to exacting requirements, but no aircraft design is capable of assuring safe and pleasant flight unless equally exacting requirements are met in caring for and operating the aircraft.

For safe and pleasant flight, use this manual as a starting point toward becoming as knowledgeable as possible about balloons and ballooning.

1.2 WEATHER

The times to fly a balloon are the hours of minimum thermal activity. In most of the continental USA, the best time begins at sunrise and extends for 2 or 3 hours, depending on Local weather conditions. The next-best time is the two-hour period before sunset.

Terminate morning flights before thermal activity begins. Delay evening flights until thermal activity has subsided and terminate them at, or before sunset.

CAUTION

TURBULENCE IS COMMON DURING THE MID-DAY HOURS. DO NOT FLY DURING THESE HOURS.

Before flying, analyze current and recently forecast weather conditions for the proposed flight area and determine whether conditions are suitable and safe for the entire time of the planned flight. Consider gross load to be carried, fuel pressure changes during flight, probable rate of fuel consumption, and direction of flight.

LIST OF EFFECTIVE PAGES

CAUTION

DO NOT FLY IF TURBULENCE, STRONG WIND SHEARS, OR THERMIC OR THUNDERSTORM ACTIVITY EXIST OR ARE LIKELY TO BE ENCOUNTERED DURING THE FLIGHT.

DO NOT FLY NEAR CUMULO-NIMBUS CLOUDS OR INTO CONDITIONS LIKELY TO PRODUCE ROTORS, GUST FRONTS OR DUST DEVILS.

DO NOT FLY IF SURFACE WINDS AT THE TIME OF LANDING ARE LIKELY TO BE SIGNIFICANTLY STRONGER THAN WINDS IN WHICH YOU HAVE PREVIOUSLY LANDED.

1.3 DAMAGE

Damage decreases an envelope's ability to withstand stresses. A damaged envelope may suffer failure under conditions of high stress, rapid ascent or descent, windy landing, turbulence, etc.

Annually, or at intervals of 100 hours inflated time, whichever time is shorter, an FAA-certified mechanic or balloon repairperson must inspect the balloon system before further flight. A record of this Annual/100 Hour Inspection must be entered in the logbook.

The Checklist for this inspection is available from Firefly Balloons and at FAA-certified balloon repair stations. As a guide in Pre-flight checking for damage, use appropriate portions of this Checklist.

If the integrity of the envelope or any other component is in doubt, have the balloon inspected by an FAA-certified mechanic or balloon repairperson before further flight.

1.4 LOG

Record all inflated time in the balloon system logbook. The record should show total time the balloon was buoyant, regardless of whether it was held on the ground, tethered, or in free flight.

It is also the balloon owner's responsibility to make sure that all repairs are correctly entered in the logbook.

1.5 REFUELING

Refueling inevitably releases small amounts of propane, and this propane must be allowed to disperse safely. When handling propane, always remember that propane vapor is heavier than air and tends to flow downward.

Never refuel inside an enclosure and especially not inside a small enclosure. Confinement can concentrate propane vapor to dangerous levels.

Any nearby ignition source is a potential danger. Among possible ignition sources are:

(1) Vehicle exhaust, hot exhaust systems of recently operated vehicles, and sparks generated by a short circuit or by an operating part of a vehicle's (or other) electrical system.
(2) Static electricity discharge, especially at low temperature and low humidity. Nylon garments and seat covers can generate static sparking.
(3) Striker and/or other pilot light igniter, unless disengaged or stowed where accidental sparking is impossible.
(4) Burner pilot lights inadvertently left alight.
(5) Smoking. Cigarette lighters. Careless bystanders

Refueling:

(1) Wear gloves. Liquid propane causes severe frostbite.
(2) Check tanks for loose fittings, dents, gouges or other obvious damage. Do not fill a damaged tank. Remove damaged tanks from the carriage before refueling.
(3) Assure that all valves including Fire 2, pilot light, tank and bleeder valves on all tanks are securely closed. Close the Pilot Light Safety ShutOff on the burner.
(4) Make sure all unused fuel hoses are capped and secured.
(5) Disconnect the main fuel line at the burner and hang it outside the carriage.
(6) Stand outside the carriage within easy reach of the tank being refueled. Do not reach across in front of one tank to reach another.
(7) Using the brass adapter, connect the incoming fuel line to the main fuel line. Keep the connection outside the carriage.
(8) Turn on incoming fuel.
(9) First: Open the bleeder valve on the tank to be filled. (Vapor bleed-out will start immediately.)
Second: Open the tank valve on this tank only.

Fill only one tank at a time. Never allow more than one bleeder valve and one tank valve (on the same tank) to be open at any one time. If a fire starts with more valves open, it will be almost impossible to extinguish without personal injury before the fire is out of control.

CAUTION

A PORTABLE FIRE EXTINGUISHER RATED NOT LESS THAN 10-B,C IN ACCORDANCE WITH NFPA NO. 10 IS RECOMMENDED.

(10) When the bleeder valve bleeds white droplets (liquid propane):
First: Close the tank valve.
Second: Close the bleeder valve. If the tank was over filled, reopen the bleeder valve to bleed off excess liquid propane, then reclose securely.
Proceed to the next tank to be filled using the procedure in (6), (9) and (10) above.
(11) When all tanks are filled, turn off incoming fuel. Disconnect the incoming fuel line slowly to allow trapped liquid propane to vaporize.
(12) Reconnect the burner or cap the main fuel hose to exclude dirt and insects.
(13) Check to be sure that all tank and bleeder valves are securely closed.
(14) Re-open the Pilot Light Safety ShutOff. Leave all other fuel system valves closed.

If tanks are removed from the carriage for outside filling, reinstall with hoses and fittings returned to correct position so they do not rub against tanks or any object that might produce damage. To assure against crossed threads or other interference, hand-tighten POL fittings until they bottom in tank valves. Then use a wrench for final tightening with hoses and fittings in correct position.

1.6 TANK HEATING

Cold weather can make pre-flight tank heating necessary to raise fuel pressure into the operating range specified in LIMITATIONS, 2.5.2.
(1) Never heat tanks by any means inside an enclosure or anywhere near any ignition source. Rising temperature may cause a Tank Safety Valve to release propane.

1.6 TANK HEATING (cont'd)

(2) Never heat tanks to pressures above 240 psi. This is the pressure generated by propane at 125 F/ 52 C.
(3) Do not concentrate heat upon the bottom or upon any small area of a tank. Spot-heating is dangerous. Flame-heating is even more dangerous.
(4) It is recommended that only full tanks be heated and that heat be applied to tank areas backed by liquid fuel, not vapor. For pre-flight heating and for retaining heat during flight, tank-heater jackets are recommended. These are heat-retaining jackets which contain well-insulated wrap-around electric heating elements located to apply heat over an area backed by liquid fuel.
(5) Rising fuel pressure in each tank must be monitored as heating progresses. It is recommended that the heat-jacketed tanks remain installed in the carriage and connected into the fuel system so the Fuel Pressure Gauge can be used for monitoring:
    (a) Mount and connect the burner(s), cap unused hoses and close all valves on tanks and burner(s).
    (b) Open one Tank Valve. Fuel pressure Gauge will show pressure in this tank.
    (c) Close this Tank Valve and then open the Trigger Valve to bleed trapped fuel pressure back down.
    (d) Repeat (b) and (c) For each tank.
    (e) When finished, open both valves on the burner(s) to bleed fuel hoses, than close the Trigger Valve(s). Dismount the burner(s) before transport.

Always be cautious when burning high-pressure fuel and be especially cautious with first burns. The rapid flow of high-pressure fuel through a cold burner may produce an unexpectedly large initial burst of flame.

1.7 ENVELOPE SKIRT

An envelope skirt assists in controlling direction of the burner flame and decreases dissipation of the lower part of the hot-air mass contained in the envelope. Skirts are required on all Galaxy models.

1.8 FAA-REQUIRED DOCUMENTS

The FAA requires that the following documents be carried aboard during all flight:
(a) Balloon Flight Manual.
(b) Airworthiness Certificate.
(c) Registration Certificate.

THIS BALLOON SHALL BE OPERATED IN ACCORDANCE WITH THE FOLLOWING LIMITATIONS.

2. LIMITATIONS

See corresponding Section Numbers in 2A, AMPLIFIED LIMITATIONS for amplified information on limitations shown below.

2.1 GROSS WEIGHT - Limit - 1680 lbs / 762 kg.

2.2 ENVELOPE TEMPERATURE - Limit 300 deg F / 149 deg C.

2.3 ENVELOPE VALVE OPERATION
- 2.3.1 Limit, Open Time per Actuation: 4 seconds
- 2.3.2 Limit, Rate of Descent for Opening Valve: 600 ft./ 180 m. per minute.

2.4 RATE OF CLIMB - Limit: 1,000 ft./ 305 m. per minute

2.5 HEATER SYSTEM
- 2.5.1 Burner: TBW T3-017 or F1.
- 2.5.2 Fuel: Propane (LPG) only
- 2.5.3 Tank Pressure: 65 to 200 psi
- 2.5.4 Tanks: FAA-Approved fuel tanks.
- 2.5.5 Unused Fuel Hoses: Capped and Secured

2.6 KIND OF OPERATION: Day, VFR

2.7 TWO INDEPENDENT SOURCES OF IGNITION MUST BE CARRIED

2.8 ENVELOPE SKIRT REQUIRED FOR FLIGHT

2A AMPLIFIED LIMITATIONS

All items below refer to corresponding Section Numbers in SECTION 2, LIMITATIONS.

2A.1 GROSS WEIGHT

Do not under any circumstances exceed the LIMITATIONS, 2.1 limit. Gross weight is the total weight to be lifted: balloon system, tanks, fuel, pilot, passengers and equipment. Gross weight does not include the weight of the air contained in the envelope. Gross weight may be limited to less than the LIMITATIONS, 2.1 limit by temperature and altitude. See Figure 1, Appendix A to estimate temperature-limited gross weight at various altitudes.

Follow the procedures given in Section 3.4.7 to establish the gross weight limit at liftoff.

2A.2 ENVELOPE TEMPERATURE

Do not exceed the LIMITATIONS, 2.2 LIMIT. See Figure 1, Appendix A to estimate envelope temperature required to lift various gross weights at different altitudes and ambient air temperatures.

2A.3 ENVELOPE VALVE OPERATION

2A.3.1 During flight, do not at any one time hold the envelope valve open for longer than the LIMITATIONS 2.3.1 limit. Allow time for the envelope to regain full inflation between actuations of the envelope valve.

This time-open limitation does not apply for landing.

2A.3.2 Do not open the envelope valve when the rate of descent is greater that the LIMITATIONS, 2.3.2 limit. At high rates of descent, releasing hot air from the top of the envelope causes fast intake of cooler air at the bottom and may tend to close the mouth of the envelope. This becomes especially important at lower altitude where there may not remain sufficient time to regain full control for landing.

2A.4 RATE OF CLIMB

Do not climb at a rate exceeding the LIMITATIONS, 2.4 limit. Higher rates of climb produce severe envelope distortion and raise stresses in the top of the envelope.

2A.5 HEATER SYSTEM

2A.5.1 Use propane (LPG) only. Burner design is for propane. Excessive amounts of additives (butane, methanol, etc.) may decrease burner performance and increase radiant heat.

2A.5.2 Conduct flights with static tank pressures within the LIMITATIONS, 2.5.2 range. Lower pressures decrease burner performance. Higher pressures make controlled heat application difficult. If necessary, pre-heat or pre-cool tanks so pressures will be correct during flight. See TANK HEATING, SECTION 1.6.

2A.5.3 Use only FAA-Approved fuel tanks with liquid withdrawal.

(1) Tank No. 2, is required for pilot lights and Fire 2 system. Double burner installations require one tank for each burner.

(2) Additional tanks may be installed as shown in Appendix C.

2A.5.4 Fuel hoses to unused tank positions must be capped and secured to a corner pole of the carriage.

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SECTION 2A

AMPLIFIED LIMITATIONS

2A.6 KIND OF OPERATION

VFR, Day only.

For flying at night, FAA-Approved position light equipment is required.

2A.7 TWO INDEPENDENT SOURCES OF IGNITION

Do not depend on any single source of ignition. Carry aboard at least two strikers or other igniters for relighting pilot lights or burner. Be sure that these independent sources are sufficiently windproof and that the pilot is physically able to use them properly.

2A.8 ENVELOPE SKIRT

An envelope skirt is required on Galaxy models. If so stated in LIMITATIONS, 2.8, an envelope skirt is required.

3.0 NORMAL PROCEDURES

3.1 PRE-INFLATION

3.1.1 WEATHER

Check weather forecast just prior to flight. See SECTION 1.2 for more details.

3.1.2 SITE

Select the launch area based on a flight plan which will not require intermediate or final landing in a hazardous, congested, or inaccessible area.

CAUTION

BE SURE THE LAUNCH SITE IS FREE OF POWERLINES AND OTHER HAZARDOUS OBSTACLES.

3.1.3 LOADING

Be especially careful in planning flights on hot days and/or at high altitudes. Adjust gross weight to avoid exceeding the envelope temperature limit. Always include either a temperature or weight margin for free lift. See Figure 1, Appendix A.

3.1.4 FUEL

It is recommended that a minimum of three fuel tanks be connected into the fuel system. See Appendix C for Fuel System Schematic Diagrams. Flight with less than 3 full tanks is not recommended. Check that fuel quantity is adequate for the planned flight with a safe reserve.

Two ways to determine fuel quantity are:

(1) Bleeder Valve

This is a liquid-level valve permanently set at 80% of tank volume, allowing 20% for fuel expansion. 80% is the legal limit for filling. If liquid spurts from this valve when it is opened, fuel is at or above the 80% level and the tank is full.

3.1.4 FUEL (cont'd)

(2) Weight

Weighing is the most accurate and reliable way to measure fuel quantity, and the only way if the tank is filled between 35% and 79% of total tank volume. Liquid propane weighs 4.24 lbs. per gallon at 60 F. See SECTION 6.1 for weight of tanks and fuel.

The Tank Fuel Gauge (top center of each tank) is intended for fuel management during flight. This gauge cannot be used to verify that a tank is full. It may, however, furnish a negative check: if it reads less than 35%, the tank is not full.

When reading this gauge for any purpose, shake the top of the tank to assure that the gauge mechanism is not stuck.

3.1.5 BURNER AND FUEL SYSTEM

(1) Install burner support with fuel line cover at corner No. 2 (corner to the left of the Fuel Pressure Gauge when looking down on carriage).
(2) Check burner for damage. Install burner with fuel fittings toward Corner No. 2.
(3) Check tank straps for damage. Assure that straps are snug.
(4) Check fuel hoses and fittings for damage. Connect fuel hoses to burner. Make sure that all fuel connections are snug.

CAUTION

POSITION HOSES SO THEY DO NOT RUB AGAINST TANKS OR CARRIAGE AND SO THAT FORCE CANNOT BE EXERTED AGAINST FITTINGS.

(5) With both valves (Trigger and Pilot Light Safety ShutOff) on burner closed, pressurize fuel system by opening tank valve and Pilot Light Valve on Tank No. 2. Sniff test the entire pressurized system for fuel leaks.
(6) Open Pilot Light Safety ShutOff. Light and visually check pilot lights.
(7) Operate Trigger Valve and check burner operation. Check for leakage around stem of Trigger Valve. Operate and check Fire 2.
(8) Close all valves on tank, then open both valves on burner to bleed fuel hoses.
(9) Re-close both valves on burner. Leave all fuel system valves closed in preparation for inflation.

3.1.6 INSTRUMENTS

Check that the instruments are undamaged and that batteries, if fitted, are good.

3.1.7 EQUIPMENT

Check that two burner ignition sources and all FAA required documents (see SECTION 1.8) are aboard. Secure and stow away additional equipment and gear.

3.3 INFLATION

3.3.1 COLD AIR INFLATION

Fill the envelope with cold air. While the envelope is filling:

(1) Fasten the envelope valve in place with its Velcro inflation tabs.
(2) Check the envelope for damage.
(3) Check envelope valve centering cords and bridle cords for damage and tangles.
(4) Install Mechanical Temperature Gauge, if fitted.
(5) Check the envelope valve line for crispness, glazing or other damage.
(6) Make sure that the valve line passes through its guide ring properly and that it emerges between the correct suspension cables. Check the rope that holds the guide ring for twists/ tangles.
(7) Using the leather thong, tie the end of the valve line to the burner support just below the burner mount.
(8) Check to be sure that the valve line will not be in the path of the burner flame.

As the inflation progresses, check that the Mechanical Temperature Gauge (if fitted) does not foul in the cords. If tangles develop, correct them before ignition.

3.3.2 IGNITION

(1) Check that everyone and everything is clear of the burner.
(2) Open Pilot Light Valve (on Tank No. 2) and Pilot Light Safety ShutOff (on burner).
(3) Ignite the pilot lights.
(4) After making sure that the Trigger Valve is in its closed position, open the tank valve of Tank No. 2 to provide fuel to the main burner.

3.2 LAYOUT

3.2.1 AREA

Select envelope lay-out area and check for sharp objects that might damage fabric. Check again for powerlines and other hazardous obstacles.

3.2.2 CARRIAGE

Check integrity of carriage frame, panels, and wickerwork. Lay the carriage down on its long side, pointing downwind, with Tank No. 1 up. Check suspension ropes, floor, and all fittings for damage.

3.2.3 ENVELOPE

(1) Put the envelope downwind with Gore No. 1 on top. Gore numbers are marked on both top and bottom girdles. About ten feet downwind of the carriage, remove the bottom of the envelope from its bag. Carry the open bag downwind to lay out the envelope. Lay out the crown line downwind.
(2) Thread each suspension rope toggle loop through the support loop, on its corner (outside) of the burner support frame. See Illustration A.
(3) Connect suspension cable toggles to the appropriate suspension rope loop - Toggle No. 1 to Corner No. 1, etc. (toggles are numbered). Put toggles through from the outside of the loop.
(4) Make sure that suspension cables are not fouled or twisted.
(5) Clip temperature sensor wires (if fitted) to appropriate metal suspension cables or to alternate sensor connections if provided.
(6) Install the Envelope Valve Line Pulley System, if equipped, as shown in Appendix E insuring that the lines are not twisted or fouled and that the pulleys run freely.

3.3.3 HEATING

(1) Heating should not begin until the envelope is fully inflated with cold air. The burner flame creates a low pressure which will draw loose fabric towards the flame.

(2) Operate the burner by squeezing the Trigger Valve handle towards the wood burner handle. Do not lock the Trigger Valve open during inflation.

(3) Direct the flame away from skirt, envelope, suspension cables and valve line. If necessary, have suspension cables held away from burner flame until they tighten.

(4) As the envelope rises, have an assistant hold back on the crown line to restrain overtravel and oscillation of the erected envelope.

3.4 PRE-FLIGHT

3.4.1 CROWNLINE

Using the provided leather thong, tie the end of the crown line to a leg of the burner support.

CAUTION

DO NOT SHORTEN EITHER ENVELOPE VALVE LINE OR CROWN LINE. USE ONLY THE PROVIDED LEATHER THONGS TO TIE THE ENDS OF THESE LINES TO THE CARRIAGE.

The leather thongs are break-away failsafes against:

(1) Uncontrollable opening of the envelope valve and/or envelope distortion at any extreme of envelope elongation.

(2) Envelope distortion and/or damage if lines are snagged by low-level obstacles.

3.4 PRE-FLIGHT (cont'd)

3.4.2 ENVELOPE VALVE

After the envelope is standing erect:

(1) Check the valve line. It must run freely through the guide ring. Check to be sure it is not looped around the guide ring and that it is not behind or entangled in the rope that holds the ring. Also check to be sure this rope is not twisted. Correct any rigging error(s) before continuing.

(2) Continue heating, but not enough to lift the carriage.

(3) Pull the valve line to open the valve and pull it free of the Velcro inflation tabs.

(4) After verifying that all inflation tabs are disengaged, release the valve line and allow the valve to seat across its

(5) opening.
Check the valve for sealing and centering. If necessary, open and close the valve again to allow it to seal and center

(6) properly.
Re-check all rigging. Correct any tangles before continu-

(7) ing.
Check valve line tie-off. The end must be tied off with its leather thong only.

3.4.3 DAMAGE CHECK

Check envelope, skirt, valve, valve line and suspension cables for damage inflicted during inflation.

CAUTION

THE PILOT IS RESPONSIBLE FOR SAFETY. THE PILOT'S RESPONSIBILITY SUPERSEDES ALL OTHER FACTORS WHICH MAY FAVOR CONTINUING THE LAUNCH. DO NOT FLY IF THE INTEGRITY OF ANY COMPONENT IS IN DOUBT.

3.4.4 INSTRUMENTS

Set altimeter to takeoff altitude or barometric pressure. Zero the Rate of Climb or turn on the Variometer and adjust to zero. Turn on the Electric Temperature Indicator (if fitted).

3.4.5 FUEL SYSTEM

During envelope warm-up:

(1) Draw fuel from each tank for at least 4 seconds, checking static and flow pressures with the Fuel Pressure Gauge. End up back on Tank No. 2.
(2) Double check operation of pilot lights, Fire 2 and burner.

3.4.6 PASSENGERS

Load passengers and properly stow any extra payload or equipment. Brief all passengers on flight and landing procedures.

3.4.7 TEMPERATURE CHECK

(1) Heat envelope to or very near to equilibrium. Envelope temperature readings will stabilize in about two minutes.
(2) If loaded to near maximum or temperature-limited gross weight, check to be sure that free lift is available. Add the free lift temperature margin (given in Appendix A1) to equilibrium temperature. If the sum exceeds the envelope temperature limit, then sufficient free lift is not available and gross weight must be reduced before liftoff.

CAUTION

DO NOT ASSUME THAT FREE LIFT WILL REMAIN CONSTANT OR INCREASE AFTER LIFTOFF. TEMPERATURE INVERSIONS NEAR THE GROUND CAN PRODUCE AN UNEXPECTED DECREASE IN BOTH TOTAL LIFT AND FREE LIFT AS THE BALLOON ASCENDS INTO WARMER AIR.

3.4.8 LIFTOFF

Check to assure against:

(1) Obstacles in the launch path.
(2) Anyone holding on to any ropes or the carriage as it ascends.

CAUTION

RELATIVE WIND PASSING OVER THE TOP OF THE ENVELOPE CAN PRODUCE AERODYNAMIC ("FALSE") LIFT. FALSE LIFT CEASES WHEN THE BALLOON MOVES WITH THE WIND

3.5 FLIGHT

3.5.1 FUEL MANAGEMENT—MAIN BURNER

Inflate and test on Tank No. 2. Either before liftoff or after reaching flight altitude, switch to the highest-numbered tank (farthest from the burner) and begin using tanks in decreasing-numbered sequence. Keep the fuel remaining in Tank No. 2 in reserve.

CAUTION

ALWAYS MAINTAIN A FUEL RESERVE FOR LANDING AND FOR EMERGENCIES

Carefully monitor remaining fuel. Calculate fuel use in gallons per hour by timing fuel consumption early in the flight. Use the Fuel Pressure Gauge and Tank Fuel Gauges (top center of each tank).

The Fuel Pressure Gauge shows the drop from tank pressure to fuel flow pressure during burner operation. Increasingly large pressure drops indicate that very little fuel remains in the tank. As fuel flows from a tank:

(1) Internal vaporizing cools the remaining fuel.
(2) Long burns cool more than short ones.
(3) Both cooling and the resulting pressure drop escalate as remaining fuel diminishes.

FUEL MANAGEMENT—MAIN BURNER (cont'd)

When usable fuel is exhausted and liquid withdrawal ends, the tank's internal standpipe will draw vapor. Pilot lights will remain alight and the burner will still operate, but at only a fraction of the required output. Operating the burner on vapor alone will heat burner coils red-hot and if continued, may cause damage.

The pilot should be alert for indications that liquid withdrawal is ending:

(1) The sound of the burner will change.
(2) The appearance of the burner flame will change.
(3) The Fuel Pressure Gauge will show a drastic pressure drop when the burner is operated.

Learning to recognize the above indications is best done on the ground by exhausting a near-empty tank down through termination of liquid withdrawal. This also serves to identify the level (Tank Fuel Gauge reading) at which liquid withdrawal terminates in this tank.

Liquid termination levels can vary from tank to tank. Unless the termination level of a particular tank has been specifically determined as above, always assume that liquid withdrawal will end when the Tank Fuel Gauge reads 8%.

Tank Fuel Gauges are float-type liquid-level gauges. When reading these gauges, shake the top of the tank to assure that the gauge mechanism is not stuck.

These gauges show % of total tank (not fuel) volume. Gauge readings can, however, be easily converted to remaining usable fuel.

FUEL MANAGEMENT—MAIN BURNER (cont'd)

The gauge will remain at its maximum reading of 35 until the fuel is withdrawn to that point. The gauge then starts to operate, showing lower readings as fuel is further depleted. Any reading below 35 can be converted to US gallons or litersof remaining usable liquid fuel by consulting the applicable chart in APP B.

Liquid termination levels can vary from tank to tank. For terms other than US gallons and for tanks with other termination levels, see Appendix B.

3.5.2 FUEL MANAGEMENT - FIRE 2

Fire 2 draws fuel from Tank No. 2 only. Fire 2 will draw liquid fuel through its own separate standpipe in Tank No. 2 down to 1% of the total tank volume.

CAUTION

ALWAYS CLOSE THE FIRE 2 VALVE TIGHTLY AFTER USE

If Tank No. 2 is inadvertently emptied in flight, it can be refueled from another tank by opening both tank valves at the same time. Reserve fuel should be in Tank No. 2 so it is available to the Fire 2 system.

3.5.3 ASCENDING

If wind shears are encountered, direct the flame away from the fabric.

3.5.3 ASCENDING (cont'd)

Air flow around the envelope may generate turbulence at or above the burner. The pilot can sometimes - but not always - feel this turbulence. Be very careful directing the flame during ascent, and particularly during rapid ascent. (An envelope skirt minimizes the effect of wind shear and turbulence on the burner flame).

Rates of climb up to 300 ft. (91 m.) per minute are recommended as normal procedure. For more rapid ascent:

(1) The turbulence noted above may increase.
(2) The balloon may slowly rotate.
(3) The envelope may alternately elongate and compress.
(4) The top of the envelope may distort and the balloon may climb sideways.
(5) A hot envelope suddenly released from ground restraint (a so-called "jump start") can develop an excessive rate of climb if the difference between envelope and ambient temperature is not carefully limited.

CAUTION

AFTER A LONG BURN, ENVELOPE TEMPERATURE WILL CONTINUE TO INCREASE FOR SEVERAL SECONDS. ALLOW FOR AFTER-BURN INCREASE TO AVOID EXCEEDING THE ENVELOPE TEMPERATURE LIMIT. EXERCISE SPECIAL CARE WHEN USING DOUBLE BURNERS. BEWARE OF BURNER FLAME INSTABILITY. (SEC. 4.5)

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SECTION 3

NORMAL PROCEDURES

3.5.4 RESPONSE TO CONTROLS

After launch, climb to a safe altitude and test for response to:

(1) Changes in envelope temperature.
(2) Opening the envelope valve. The valve is an extremely effective control. Use with caution until familiar with its effect.

Balloon response depends on several variables:

(1) Decreased gross weight improves response. Note that gross weight decreases as fuel is used in flight.
(2) High fuel flow through the burner improves response. Warm fuel provides pressure for high fuel flow. Flow decreases at the lower pressure provided by diminished and/or cooled fuel.
(3) Dense ambient air improves response. A cold day improves air density - but also cools fuel unless tanks are pre-warmed and insulated. Altitude also affects air density; even if very cold, air is less dense at high altitudes.

CAUTION

FABRIC WEAR AND VARIATION IN POROSITY MAY CAUSE INDIVIDUAL BALLOONS OF THE SAME VOLUME TO RESPOND DIFFERENTLY UNDER SIMILAR CONDITIONS. OLDER BALLOONS MAY DETERIORATE IN RESPONSIVENESS FROM ONE FLIGHT TO THE NEXT.

3.5.5 LEVEL FLIGHT

Level flight is more fuel-efficient than climbs and descents. In all flight, controlling the balloon with burner alone is more fuel-efficient than alternating between burner and envelope valve.

3.5.6 DESCENDING

Start descent either by opening the envelope valve or by allowing the envelope to cool. Control the rate of descent with burner and envelope valve.

During descent, the envelope may distort and the balloon may slowly rotate. If the loser part of the envelope tends to close, use short burns to stabilize the descent.

Rates of descent up to 500 ft. (152m.) per minute are recommended as normal procedure. For faster rates of descent, consult SECTION 5, PERFORMANCE. Always start recovery from any descent early enough to recover to level flight and full control well above the level of dangerous obstacles.

CAUTION

LONG BURNS MAY BE NECESSARY TO RECOVER FROM RAPID DESCENT. ALLOW FOR CONTINUED AFTER-BURN INCREASE IN ENVELOPE TEMPERATURE TO AVOID EXCEEDING THE LIMIT. EXERCISE SPECIAL CARE WHEN USING DOUBLE BURNERS. BEWARE OF BURNER FLAME INSTABILITY (SEC. 4.5)

3.5.7 PRIOR TO LANDING

(1) Stow and secure all loose gear.
(2) Check for fuel quantity and pressure adequate to clear obstacles and land. Plan ahead to avoid switching tanks during the landing.

(3) Assure that tank restraints are snug and that all valves not to be used for landing are firmly closed.
(4) Remind passengers of landing procedures.

3.6 LANDING

Allow for wind speeds in planning the landing approach. During approach, limit descent rates to avoid:

(1) Excessive burning to clear obstacles.
(2) Extensive final burning resulting in touchdown with a hot envelope.

The best approach ends in touchdown (as gentle as possible) with the envelope below equilibrium temperature and cooling rapidly as the pilot continues to hold the envelope valve open. Advantages of a cool envelope become especially important in windy conditions:

(1) Less effort to open/hold open the envelope valve.
(2) Quicker response to the valve for rapid descent if necessary.
(3) Less probability of rebound after touchdown and less forcible rebound if one does occur.
(4) Quicker envelope laydown and deflation to avoid dragging after touchdown.

Limitations on using the envelope valve do not apply for landing. The valve may be used at the pilot's discretion - and discretion is required because:

(1) Descent rates that seem gentle at higher altitudes may be faster than desired for landing.
(2) Descent from wind into calmer air may slow the envelope and increase relative wind across the top, producing false lift and at the same time cooling the envelope. As descent continues, false lift will cease, allowing the cooled envelope to descend at an increased rate.

3.6 LANDING (cont'd)

(3) Lower envelope temperatures make the valve easier to open and also increase response to the valve.
(4) Lower altitudes increase response to the valve and leave insufficient time to correct from over-valving.

CAUTION

OVER-VALVING AT LOW ALTITUDE CAN RESULT IN UNCONTROLLED DESCENT TO A HARD LANDING. EXERCISE EXTREME CARE WHEN LANDING AT DESCENT RATES APPROACHING 500 FEET PER MINUTE AND/OR IN WINDS ABOVE 7 MILES PER HOUR.

FOR HARD LANDINGS, SEE SECTION 4.4

Select a landing site as free as possible from obstacles that might damage the balloon - but with this exception:

DO NOT HESITATE TO RISK DAMAGE AND/OR HARD LANDINGS TO AVOID ANY POSSIBILITY OF CONTACT WITH POWERLINES OR OTHER DANGEROUS OBSTACLES. FOR DANGEROUS OBSTACLES, SEE SECTION 4.1.

Select a landing site where the pilot alone can control the landing. A ground handling line should be deployed only in very calm conditions. In avoiding dangerous obstacles, do not depend upon ground personnel for restraint of handling line or carriage.

CAUTION

FIREFLY BALLOONS DROP LINE IS NOT A TETHER LINE. DO NOT USE IT TO FORCIBLY RESTRAIN A BALLOON.

3.6 LANDING (cont'd)

Just prior to touchdown:
(1) Make sure that the Trigger Valve (and/or Fire 2 Valve if in use) is firmly closed.
(2) Close the Pilot Light Safety ShutOff.

Action (2) is a precaution against possibility that pilot lights or accidental burning might damage the envelope or ignite anything at the landing site. Note that (2) commits the pilot to the landing and must be delayed until possibility of a missed approach is past.

For landings to be followed by another take-off, provided touchdown is gentle and winds are light:

(1) Action (2) above may be omitted, leaving the burner operable. If however, it is seen that touchdown will be harder or winds stronger than expected, close the ShutOff and then relight pilot lights after the landing is complete.
(2) Keep the envelope inflated and erect, but at well below equilibrium temperature.
(3) Ensure that the balloon is properly restrained before exchanging passengers. Exiting passengers give the effect of added lift. Windflow over the envelope may provide temporary false lift.
(4) Brief new passengers and repeat appropriate pre-flight checks before take-off.

After touchdown:

(1) In calm conditions or in very light wind, use the crown line to pull the envelope aside so it does not deflate around the carriage. Laying the carriage over toward the deflating envelope makes it easier to prevent suspension cables, skirt or envelope from contacting hot burner coils.
(2) In windy conditions, deflate the envelope quickly so it cannot drag the carriage.

3.6 LANDING (cont'd)

(3) If rebound is forcible, release the envelope line when rebound pulls it upward and then re-open the valve as soon as possible.

After landing, bleed all fuel lines:

(1) Make sure that all valves on all tanks are firmly closed.
(2) Check for safety before bleeding fuel lines. If necessary, postpone (3) to a safe location.
(3) Open the Trigger Valve and the Pilot Light Safety ShutOff. Do not leave the pilot light system pressurized for long periods of time, i.e., do not leave the system with Pilot Light Valve open and Pilot Light Safety ShutOff closed for extended periods.

3.7 PACKUP AND STORAGE

3.7.1 ENVELOPE

(1) After deflation is completed, disengage and stow suspension cable toggles in their marked storage loops.
(2) Remove Mechanical Temperature Gauge if installed.
(3) Dry wet envelopes before storage.
(4) Pack the envelope and store out of sunlight as soon as possible.

3.7.2 FUEL SYSTEM

After assuring that no fuel is trapped in any line, close the Trigger Valve. Leave the Pilot Light Safety ShutOff in open position.

Before transport:

(1) Dismount the burner from the burner support.
(2) Adjust fuel hoses so they do not contact tanks, vibrate against damaging objects, or protrude enough to be hit and damaged during travel. Cord or leather lacing may be used to secure hoses.

CAUTION

TRANSPORT TANKS IN POSITION IN THE CARRIAGE TO AVOID VALVE DAMAGE THAT MIGHT OCCUR BECAUSE OF THE TOP COLLAR CUTOUT.

For long periods of storage and/or for storage at low temperatures, it is recommended that tanks be filled to the legal (80%) limit to avoid contamination from internal moisture condensation.

CAUTION

RISING TEMPERATURE MAY CAUSE THE TANK SAFETY VALVE TO RELEASE PROPANE. STORE TANKS OR CARRIAGE WITH TANKS INSTALLED IN A WELL-VENTILATED PLACE. DO NOT STORE UNDERGROUND OR INSIDE AN ENCLOSURE OR NEAR ANY POSSIBLE IGNITION SOURCE.

3.7 PACKUP AND STORAGE (cont'd)

If tanks are removed from the carriage for separate storage, cap fuel hoses to exclude dirt and insects. When reinstalling tanks, return hoses and fittings to correct position so they do not rub against tanks or any object that might produce damage. To assure against crossed threads or other interference, hand-tighten POL fittings until they bottom in tank valves. Then use a wrench for final tightening with hoses and fittings in correct position.

3.7.3 INSTRUMENTS

(1) Turn off electric instruments.
(2) Do not subject instruments to sudden high pressures, extreme temperatures or shock.
(3) Keep instruments dry and clean.

3.7.4 LOG

Immediately note any damage or malfunction in the logbook. Log total time the balloon was buoyant, regardless of whether it was held on the ground, tethered, or in free flight.

4.0 EMERGENCY PROCEDURES

4.1 DANGEROUS OBSTACLES

Among dangerous obstacles - towers, guy wires, projections on buildings, smoke stacks, stacks emitting industrial vapors, etc. - POWER LINES are the most prominent. Powerlines are dangerous regardless of their size. Utility poles carrying dangerous currents often have hard-to-see top mounted wires capable of ensnaring a balloon.

If there is any possibility that a balloon might not clear a dangerous obstacle, land immediately. An unsuccessful attempt to clear can produce the worst possible result: entangling the carriage in a dangerous obstacle.

CAUTION

WHEN FUEL QUANTITY DIMINISHES SO DOES FUEL PRESSURE. THIS DECREASES THE CAPABILITY FOR CLIMBING TO CLEAR OBSTACLES. RISK A HARD LANDING AND/OR DAMAGE TO AVOID ANY POSSIBILITY OF CONTACT WITH POWER LINES OR OTHER DANGEROUS OBSTACLES. BEWARE OF BURNER FLAME INSTABILITY (SEC. 4.5)

If power line contact is unavoidable, get the carriage as close to the ground as possible. Injury is less likely if contact is made by the envelope only and still less likely if contact is limited to the top of the envelope.

For a balloon in contact with a power line of any kind:

(1) ASSUME THAT BOTH ENVELOPE AND CARRIAGE ARE FULLY ELECTRIFIED. Fabric and ropes may be conductive from even small amounts of moisture or soil.
(2) Order anyone on the ground to not touch any part of the balloon or any attachment (including a drop line) and to keep clear of any downed POWER LINES.
(3) Prevent anyone exiting the carriage from touching any part of the balloon and the ground at the same time.

(4) Do not attempt to remove a balloon from a power line yourself. Notify the power authority and request that it shut off power and remove the balloon.

4.2 BURNER RELIGHT

4.2.1 Pilot Lights Accidentally Extinguished:

(1) Check to assure that both Pilot Light Valve on Tank No. 2 and pilot light Safety ShutOff on burner are open.
(2) Relight at least one pilot light, then operate the burner. Burner flame will normally light the other pilot lights.

4.2.2 Pilot Lights Inoperative: (land as soon as convenient)

CAUTION

FOR PROCEDURES BELOW, OPEN THE FIRE 2 OR TANK VALVE SLIGHTLY - ONLY ENOUGH SO THAT VAPOR FLOWS FROM THE NOZZLE(S). A HARD, FULL PRESSURE FUEL STREAM IS ALMOST IMPOSSIBLE TO LIGHT WITH AN IGNITER. PRACTICE AND MASTER THESE PROCEDURES BEFORE USE IN AN EMERGENCY.

(1) Open Fire 2 Valve slightly.
(2) Light vapor with an igniter inserted in the burner nearest a Fire 2 nozzle.
(3) Adjust the flame to a level that will serve as a pilot light.

CAUTION

A FIRE 2 TANK VALVE LEFT OPEN AT THE SAME ADJUSTMENT FOR A LONG PERIOD OF TIME MAY FREEZE IN POSITION. TO AVOID THIS, ROCK THE VALVE HANDLE BACK AND FORTH A MINIMUM OF 1/8 TURN AT LEAST ONCE PER MINUTE.

4.2 BURNER RELIGHT (cont'd)

-OR-

(1) Close the tank valve in use.
(2) Bleed hose by opening Trigger Valve, then lock Trigger Valve open.
(3) Open tank valve slightly.
(4) Light vapor with an igniter inserted between top lip of the burner can and the bottom of the vaporizing coils.
(5) Regulate burner flame with the tank valve.

4.3 FUEL LEAKS

All fuel leaks pose a fire hazard and require landing as soon as possible.

Nothing in any procedure given in this manual is intended to allow possibility of igniting leaking fuel. Never in any case operate any ignition source if fuel is still leaking or if the carriage contains or is surrounded by leaked fuel. A hard, burner-off landing is a better choice.

Main Fuel System Leak:

(1) Close Pilot Light Safety ShutOff.
(2) Close tank valve on tank in use (other tank valves should already be closed).
(3) Lock Trigger Valve open.
(4) After propane vapor has dispersed, relight pilot lights and land on Fire 2

CAUTION

ALLOW FOR MUCH SLOWER BALLOON RESPONSE WHEN USING FIRE 2 INSTEAD OF THE MAIN BURNER SYSTEM. LOW FUEL PRESSURE AND/OR HEAVY LOADS FURTHER SLOW RESPONSE. EXERCISE SPECIAL CARE IN KEEPING DESCENT RATES UNDER CONTROL WHEN USING FIRE 2 ALONE.

4.3 FUEL LEAKS (cont'd)

Fire fed by Main Fuel System leak:

(1) Lock Trigger Valve open (decreases pressure feeding fire).
(2) Close tank valve on tank in use (other tank valves should already be closed).
(3) Close Pilot Light Safety ShutOff.
(4) After fire is out, relight pilot lights and land on Fire 2. See Fire 2 CAUTION above.

Trigger Valve O-ring leak:

(1) Lock Trigger Valve open and leave it open.
(2) If leak stops, land using the tank valve to control the burner.
(3) If leak does not stop, close the tank valve and land on Fire 2. See Fire 2 CAUTION above.

Tank Valve Stem leak:

(1) Open tank valve fully.
(2) If leak does not stop, close tank valve securely and land using fuel from other tanks.

Pilot Light System leak:

(1) Close Pilot Light Safety Shutoff.
(2) Close Pilot Light Valve on Tank No.2.
(3) If leak stops, follow procedure in SECTION 4.2.2, BURNER RELIGHT, Pilot Lights Inoperative.
(4) If leak does not stop, snap the Pilot Valve open and shut several times.
(5) If leak cannot be stopped by any means, re-open the Pilot Light Safety ShutOff (diverts leak away from pilot/passengers) but do not relight pilot lights or operate any other ignition source. Prepare for a hard, burner-off landing.

4.4 HARD LANDINGS

Consider any landing at a descent rate exceeding 500 ft. per minute an emergency. The faster the descent, the more likely is injury to occupants and damage to the balloon. FOR HARD LANDINGS, EXPECT THE FOLLOWING:

The envelope will continue to descend after carriage impact.

(1) Skirt and suspension cables will descend upon or around the carriage.
(2) Slack cables may enter the carriage.

The envelope will then reverse directions, elongating as it rebounds, temporarily uncontrollable.

(1) Suspension cables will snap taut as rebound lifts the carriage off the ground.
(2) The envelope valve line will be pulled upward forcefully.
(3) If ground wind is present, the balloon will move downwind during rebound.

The balloon will then return to the ground more gently. The cooler the envelope, the less the force and height of the rebound. An envelope above equilibrium temperature (or one suddenly relieved of occupant weight) will attempt to turn a rebound into another take-off.

FOR HARD LANDINGS, USE THE FOLLOWING PROCEDURES;

(1) Brief passengers. Assure that all fuel tank restraints are snug and that gear is secure.
(2) Close all valves on all fuel systems securely before impact. Make sure that no ignition source is operating or operable.
(3) Take a firm hand grip on the envelope valve line before impact.
(4) On impact, pull the envelope valve fully open.
(5) Keep clear of or below any slack suspension cables that enter the carriage. Rebound will snap these cables upward forcefully.
(6) Release the envelope valve line when the force of rebound and elongation pulls it upward. Do not attempt to overcome this force.

4.4 HARD LANDINGS (cont'd)

(7) At maximum envelope elongation, again pull the envelope valve fully open.

4.5 BURNER FLAME INSTABILITY ("SWOOSH")

Certain conditions, generally associated with low ambient air densities, may cause flame instability after several seconds of continuous burner operation.

Under these conditions, flameout can occur:

(1) There is a change in the sound of the burner flame - a "swoosh" noise.
If burning is continued-

(2) The burner flame may decrease in size and velocity.
If burning is still continued

(3) Burner flame and pilot lights may be extinguished.

Flameout can usually be avoided by ending the burn at the initial "swoosh" sound and leaving the burner off for one or two seconds. Further "swoosh" can be avoided by using short burns.

CAUTION

TEST LONG BURNS FOR FLAME INSTABILITY BEFORE RELYING ON THEM FOR ARRESTING RAPID DESCENT OR CLEARING OBSTACLES.

4.6 ENVELOPE DAMAGE

If damage occurs during inflation or take-off, terminate the flight.

If damage occurs during flight (such as in severe turbulence) burn only enough to keep the envelope fully inflated until the balloon climbs or descends into more stable air. Land as soon as possible.

4.6 ENVELOPE DAMAGE (cont'd)

If an envelope has sustained major structural damage, do not open the envelope valve. Keep the envelope fully inflated and allow it to cool and descend gradually.

4.7 ENVELOPE OVER-TEMPERATURE

If the envelope temperature limit is likely to be exceeded:

(1) Reduce burner use and continue flight with reduced temperature. Try a lower altitude.

(2) If envelope temperature is not reduced to an acceptable level, land and investigate cause.

If the envelope temperature limit is exceeded:

(1) Inspection of envelope fabric by FAA-certified repairperson is required before further flight

(2) A logbook entry of the inspection is required.

4.8 MAIN FUEL SYSTEM FAILURE

Use Fire 2. Take extra care in directing Fire 2 flame in windy or turbulent conditions. Land as soon as possible.

CAUTION

ALLOW FOR MUCH SLOWER BALLOON RESPONSE WHEN USING FIRE 2 INSTEAD OF THE MAIN BURNER SYSTEM. LOW FUEL PRESSURE AND/OR HEAVY LOADS FURTHER SLOW RESPONSE . EXERCISE SPECIAL CARE IN KEEPING DESCENT RATES UNDER CONTROL WHEN USING FIRE 2 ALONE.

4.9 PILOT LIGHT SAFETY SHUTOFF

This fast-action ShutOff is conveniently located on the burner beside the Trigger Valve.

Close it as a safety precaution in:

(1) Normal landings.
(2) Hard landings.
(3) Emergencies requiring immediate extinction of an ignition source.

After using this ShutOff, bleed the pilot light hose by:

(1) Closing the Pilot Light Valve on Tank No. 2.
(2) Re-opening the ShutOff.

4.10 TRIGGER VALVE STUCK OPEN

If possible without using extreme force, lock the Trigger Valve in full open position.

If the Trigger Valve will lock full open:

(1) Use the tank valve to control the burner.
(2) Land as soon as convenient.

If the Trigger Valve will not lock full open, follow (1) and (2) above, but remember that the Trigger Valve can come free and close at any time.

If neither of the above is satisfactory, close the tank valve and land as soon as possible on Fire 2. See Fire 2 CAUTION in SECTION 4.8.

4.11 LOSS OF ENVELOPE VALVELINE

If the line breaks free of the carriage, retrieve it by rocking the carriage toward it and/or by ensnaring it with an article of clothing.

4.11 LOSS OF ENVELOPE VALVE LINE (cont'd)

CAUTION

DO NOT LEAN FARTHER OUT OF THE CARRIAGE THAN IS SAFE

If the line cannot be retrieved, land by allowing the envelope to cool.

CAUTION

IF A HIGH-WIND LANDING IS EXPECTED, ANTICIPATE DOWNWIND REBOUND AND/OR DRAGGING AFTER TOUCHDOWN. SECURE TANK RESTRAINTS AND FUEL VALVES NOT IN USE. BRIEF PASSENGERS. TRY TO FIND A LARGE AREA DOWNWIND OF DANGEROUS OBSTACLES. RISK DAMAGING THE BALLOON RATHER THAN LANDING UPWIND OF POWER LINES OR OTHER DANGEROUS OBSTACLES.

4.12 WEATHER DETERIORATION DURING FLIGHT

Land immediately rather than fly into severe atmospheric turmoil. Risk damage if necessary to land while the flight is still under control. Severe atmospheric forces are capable of taking over and exposing the flight to the hazards of immense envelope stresses and uncontrollable contact with the ground and/or dangerous obstacles.

If caught aloft in turbulence or rising thermal air flow:

(1) Burn enough to keep the envelope fully inflated.
(2) Remember that surface air flow cools an envelope, even one which is ascending.
(3) Be very cautious about using the envelope valve of a cooled envelope. Over-valving may cause rapid descent into turbulence or wind shear and tend to collapse the envelope.
(4) Monitor and control envelope temperature to allow gradual cooling and descent.

5.1 SURFACE WIND AT LANDING

Maximum demonstrated wind speed at landing during certification tests was 7 knots.

5.2 DESCENT RATE

Terminal velocity is the highest rate of descent attainable by an inflated balloon system with the burner off and the envelope valve closed. Once this velocity is attained, it becomes constant and remains constant unless influenced by changes in atmospheric conditions.

At standard atmospheric conditions the Galaxy 7 balloon system loaded to its gross weight limit of 1680 can (if the pilot allows it) develop a maximum terminal velocity of approximately 1,250 ft./ min. after approximetly 1,000 feet of altitude loss.

Maximum terminal velocity can be developed only by a balloon loaded to its gross weight limit; lighter loads reduce the attainable terminal velocity.

5.3 RECOVERY FROM MAXIMUM TERMINAL VELOCITY

Recovery to level flight from maximum terminal velocity (SECTION 5.2 above) may require up to 2.5 minutes of continuous burner operation at 65 psi fuel pressure. During time required for recovery, the balloon may descend as much as 2,000 feet.

5.4 LIFT

See Figure 1, Appendix. A

6.1 WEIGHT DATA SHEET

MODEL: Galaxy ——— Registration No.———————

	SERIAL NUMBER:	WEIGHT, LBS.:
BALLOON:	———————	xxxxxxxxxxxxxx

Carriage without tanks, but with all other standard equipment and burner(s).

CARRIAGE	———————	———————
BURNER:	———————	xxxxxxxxxxxxxx
BURNER:	———————	xxxxxxxxxxxxxx
ENVELOPE:	———————	———————
SKIRT:	xxxxxxxxxxxxxx	———————

EMPTY TANK WEIGHT (See chart below)

No.	lbs.	kg.	
1.			———
2.			———
3.			———
4.			———
5.			———
6.			———

TOTAL WEIGHT, EMPTY TANKS ———————

EMPTY WEIGHT (BALLOON SYSTEM WITH TANKS, NO FUEL) [ ]

TANKS AND FUEL:

		TARE (EMPTY) TANK WEIGHT, LBS.	
GALAXY BALLOONS PART NUMBER:	TANK NO.	STAMPED ON TANK	ACTUAL WEIGHT
C6G003	2	26.5	29
C6G001	1,3,4,5,6	26.5	26.5
B3G661-1	2	48	51.5
B3G661-2	1,3,4,5,6	48	50

6.2 SAMPLE GROSS WEIGHT WORKSHEET

EMPTY SYSTEM WEIGHT (SYSTEM PLUS TANKS)

Total from SECTION 6.1..... _____

FUEL: WEIGHT,

No.	lbs.	kg.
1.		
2.		
3.		
4.		
5.		
6.		

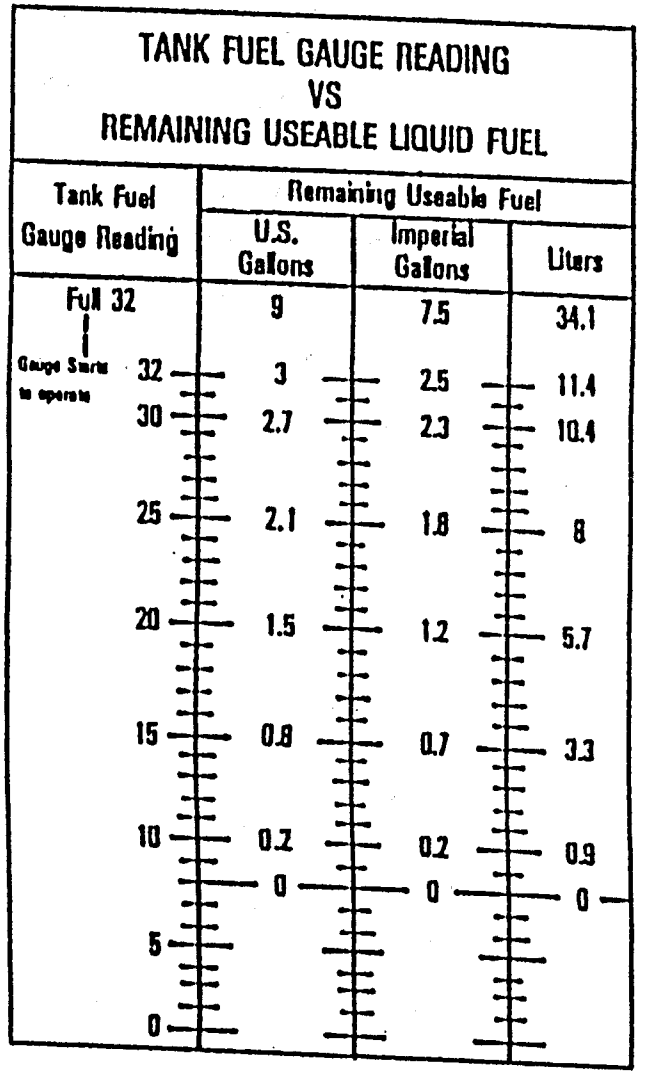
TOTAL WEIGHT, FUEL... _____ _____

OCCUPANTS & EQUIPMENT:

PILOT	
PASSENGERS	1:
	2:
	3:
	4:
	5:
	6:
EQUIPMENT	

TOTAL WEIGHT
OCCUPANTS & EQUIPMENT.... _____ _____

TOTAL GROSS WEIGHT..... [ ]



TANK FUEL GAUGE READING vs. REMAINING USEABLE LIQUID FUEL for THE BALLOON WORKS 10 GALLON FUEL TANKS WITH LIQUID WITHDRAWAL TERMINATING AT GAUGE READING 8%.

APPENDIX A1

FIGURE 1

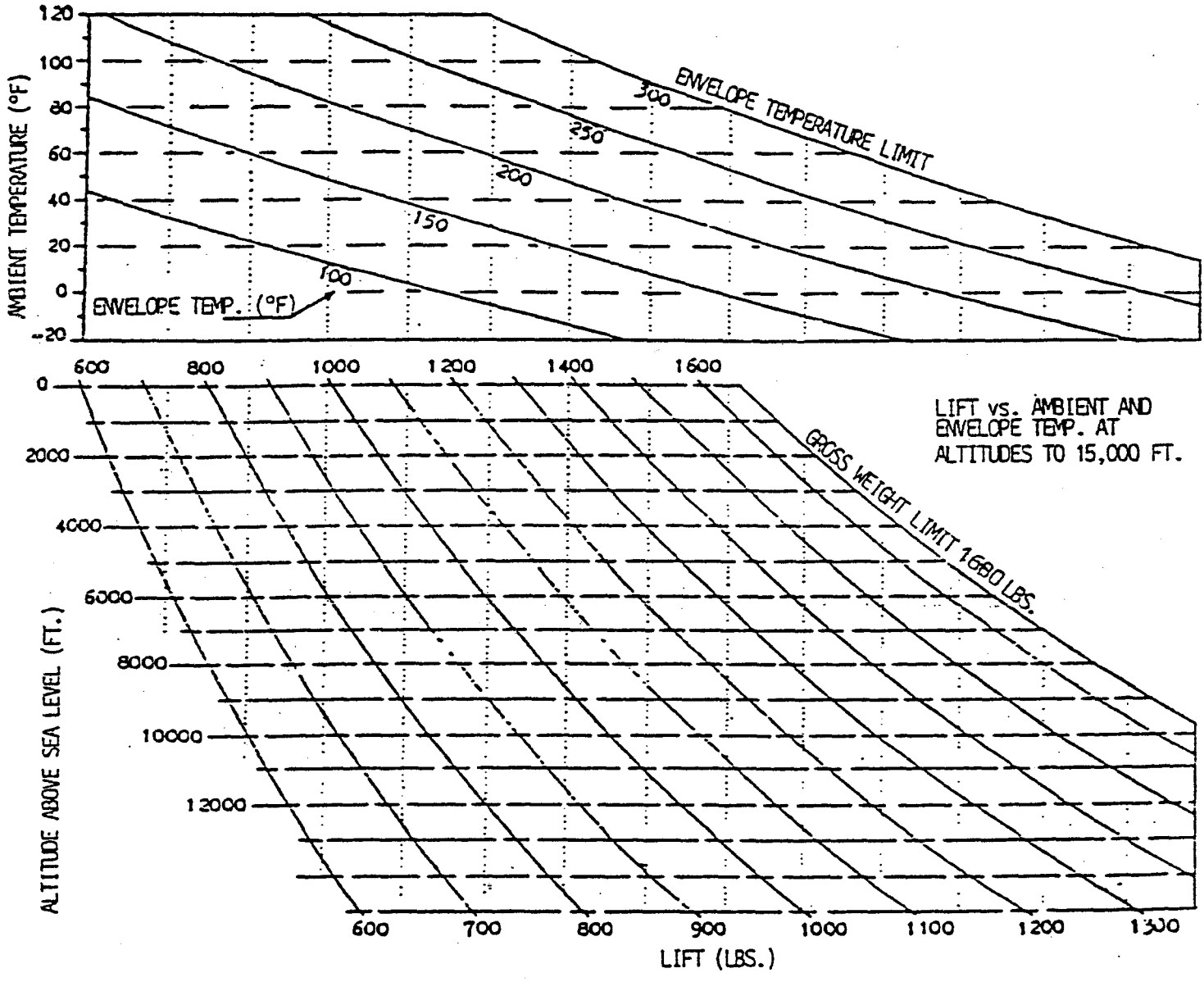


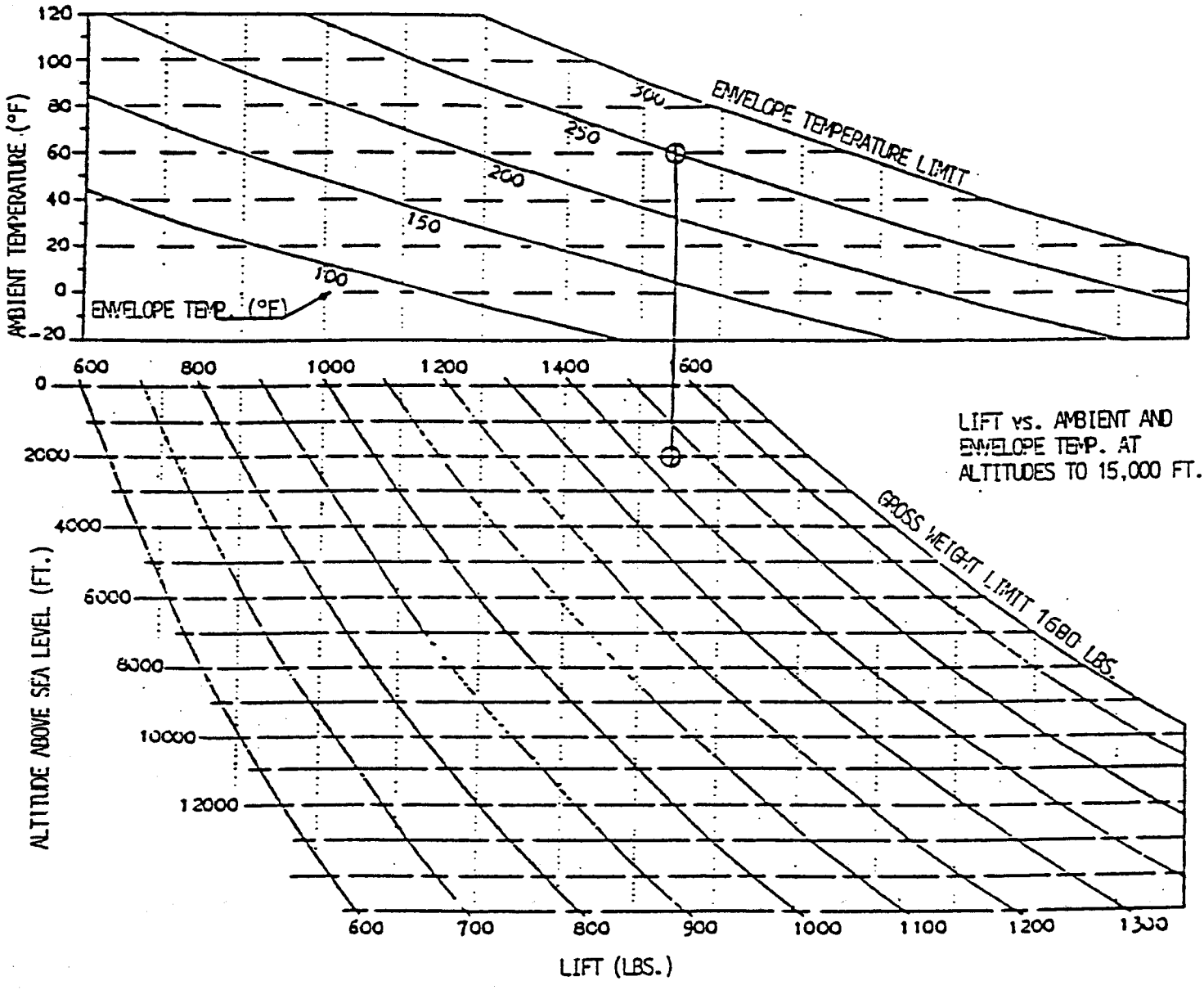
Figure 1 shows the effect of varying conditions on the lifting capability of a fully inflated Galaxy 7 envelope.

Available lift must always exceed gross weight. Excess lift is called "free" lift and it is the lift necessary for climbing.

Gross weight is the total weight to be lifted: balloon system, tanks, fuel, passengers and equipment.

Do not exceed the limits shown for gross weight and envelope temperature.

Directions and examples for Figure 1 are on the following pages.



To find temperature-limited gross weight:

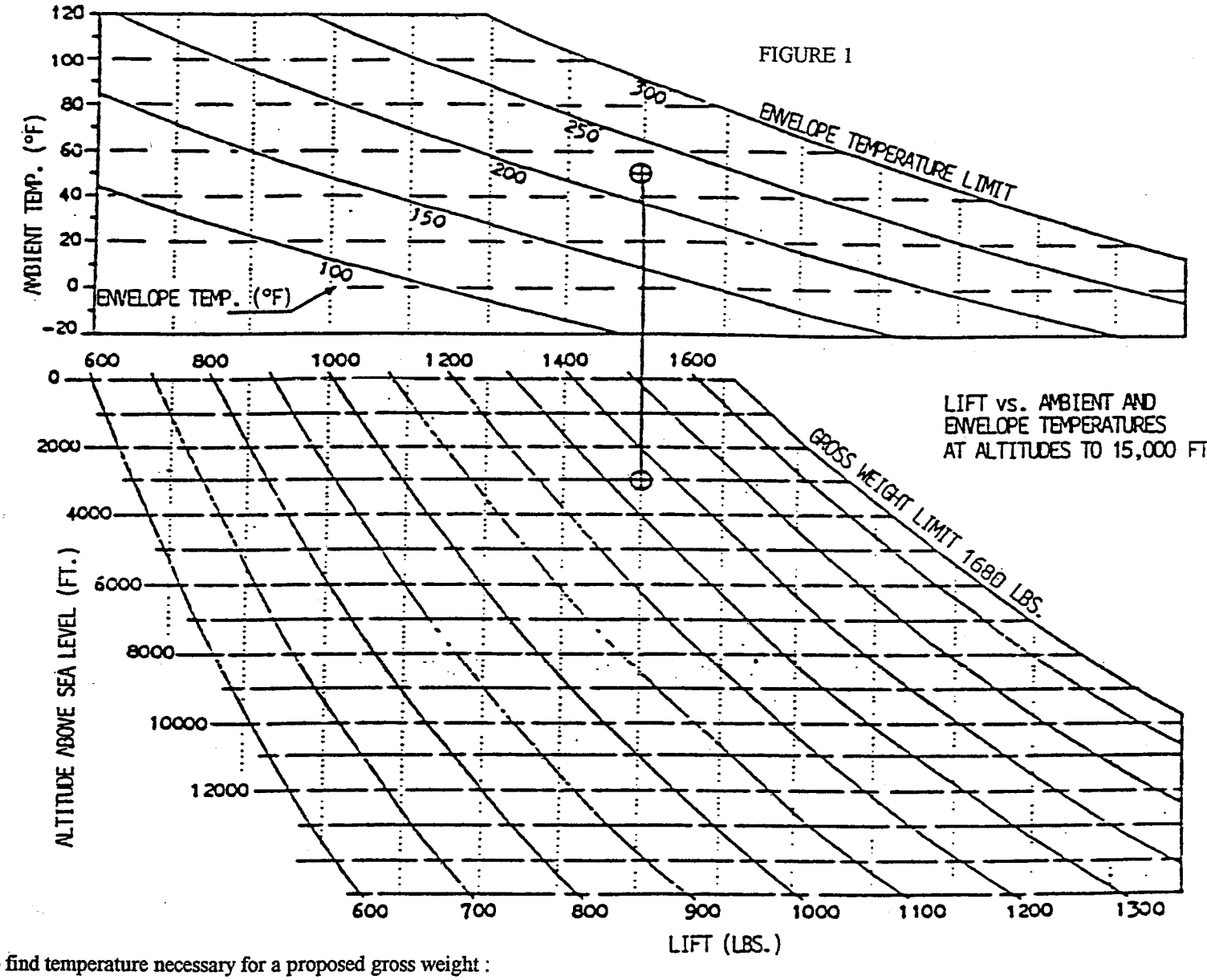
1. For free lift temperature margin, subtract 25 deg. from the proposed maximum envelope temperature.
2. Go across the appropriate horizontal ambient temperature line to this envelope temperature curve.
3. From this point, visualize a vertical line down to and intersecting the appropriate horizontal altitude line.
4. The intersection is at the temperature-limited gross weight.

EXAMPLE: Maximum proposed Envelope Temperature: 275 deg.
Ambient Temperature: 60 deg.
Altitude: 2,000 ft.

1. 275 deg. - 25 deg. = 250 deg.
2. Across 60 deg. ambient line to 250 deg. envelope temperature.
3. Vertical line down to 2,000 ft. altitude line is shown.
4. Vertical line intersects 2,000 ft. line at approximately 1,450 lbs. This is the temperature-limited gross weight.

APPENDIX A3

FIGURE 1



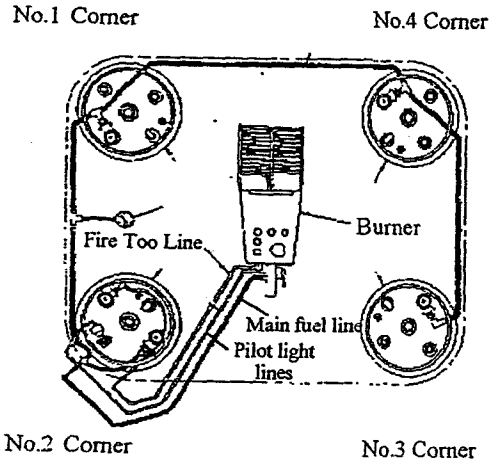
To find temperature necessary for a proposed gross weight :

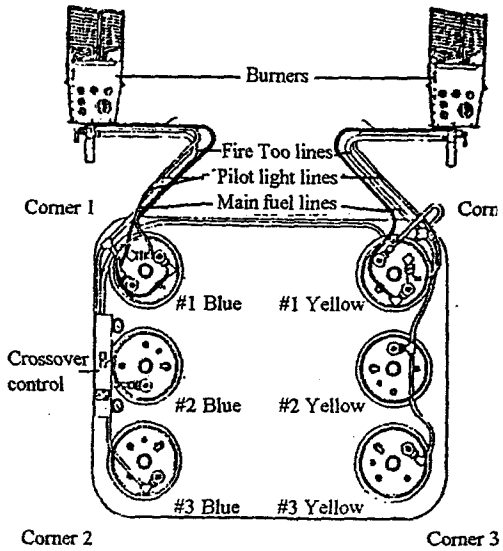
1. For free lift, weight margin add 150 lbs. to the proposed gross weight.
2. Go across the appropriate horizontal altitude line to this weight.
3. From this point, visualize a vertical line up to and intersecting the appropriate horizontal ambient temperature line.
4. The intersection is at the envelope temperature necessary for the proposed gross weight.

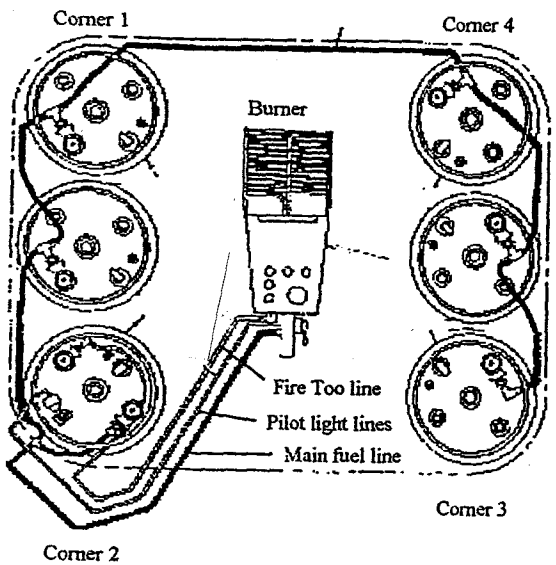
EXAMPLE: Proposed Gross Weight 1,200 lb.
Ambient Temperature: 50 deg.
Altitude: 3,000 ft.

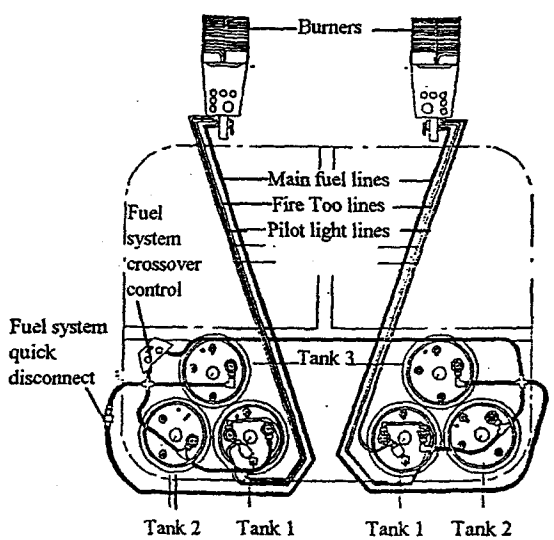
1. 1,200 lbs. + 150 lbs. = 1,350 lbs.
2. Across 3,000 ft. altitude line to 1,350 lbs. lift.
3. Vertical line up to 50 deg. ambient temperature line is shown.
4. Vertical line intersects 50 deg. line at approximately 225 deg. This is the envelope temperature necessary for the proposed gross weight.

APPENDIX C









FUEL SYSTEM SCHEMATIC DIAGRAM AND TANK I