ZU-BKK

AIRPLANE MANUAL

KIS TR-4 Cruiser
S/N 4036

Designer / Kit supplier: Tri-R Technologies
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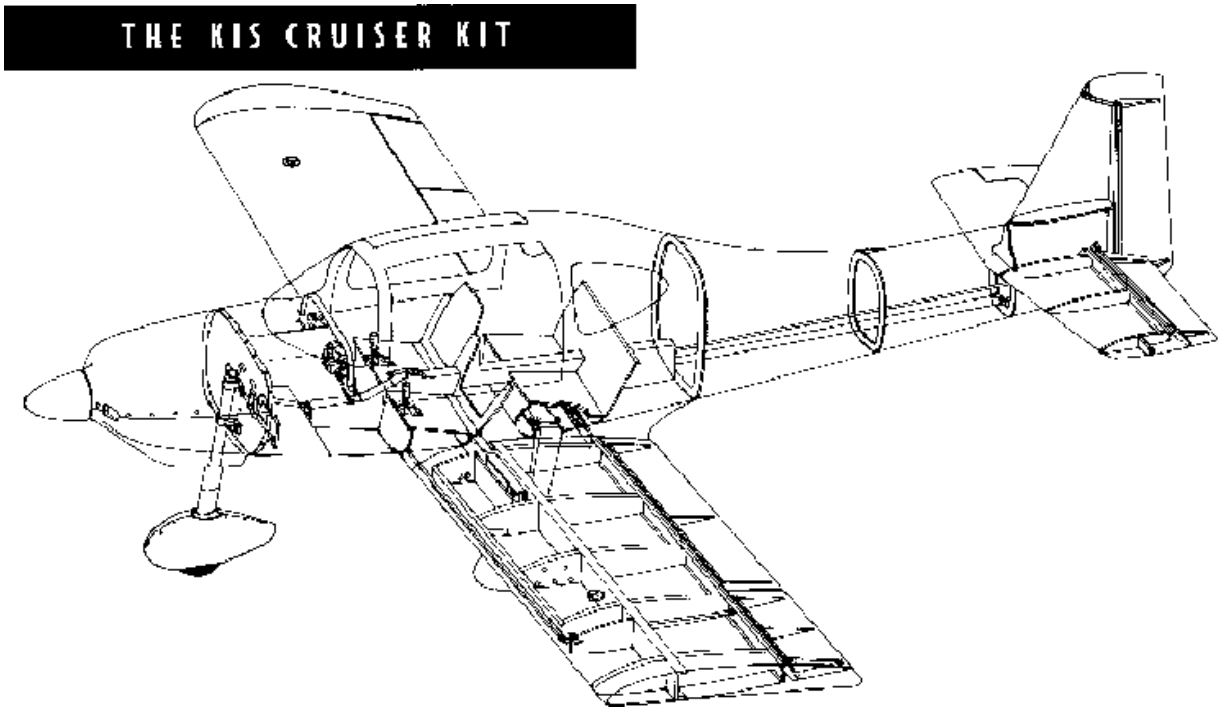
Construction period: December 1996 - December 2001



1. GENERAL

- **Dimensions and specifications**

OVERALL DIMENSIONS		**FUSELAGE DIMENSIONS**	
Length	25.46 ft. (7.7m)	Frontal Area	10.02 sq. ft.
Wing Span	29 ft. (8.8m)	Cockpit Width:	
Height (Top of tail)	7.5 ft. (2.3m)	Front Seats	44 in.
Height (Top of cockpit)	6.23 ft.(1.9m)	Rear seats	42 in.
		Cockpit Height	46 in.
		Cockpit Length	78 in.
WING DIMENSIONS		**TAIL DIMENSIONS**	
Wing Area	106 sq.ft.	Horizontal Tail Span	10 ft. 3 in. (3.1 m)
Chord	49 in.	Horz. Tail Chord	3.08 ft. (.9 m)
Aspect Ratio	7.2	Horz. Stab. Mean Chord	2.83 ft. (.85m)
Spar Locations	28% & 71% of chord	Elevator Mean Chord	14.5 in. (37 cm)
Airfoil	NACA 65-415	Horz. Tail Area	19.3 sq.ft.
Dihedral (per panel)	3 degrees	Horz. Tail Aspect Ratio	3.5
Tip Wash Out	0 degrees	Horz. Tail Thickness	12 %
Wing Loading	17 lbs/sq.ft.	Vertical Tail Area	5.91 sq. ft.
FLAPS		Vertical Tail Mean Chord	2.35 ft.
Type	Plain	Dorsal Fin	.33 x 2.5 ft.
Area/Wing	15 %	Vertical Fin Thickness	10 %
Length (Each)	83 in.		
Chord	15.3 in. @ 28%		
CONTROL MOVEMENT		**PLACARDED IAS LIMITS**	
Elevator	+25 -16 degrees	Green Arc	58 to 164 mph
Ailerons	+12 -12 degrees	Yellow Arc	164 to 216 mph
Rudder	L 24 R 30 degrees	White Arc	55 to 110 mph
Flaps	0/12/28 degrees	Red Line	216 mph
LIMITATIONS		**POWER PLANT**	
Limit Load Factor	+2.9 G	Type	Lycoming IO-360 A2B
Design Limit Load Factor	-2.2 G	Serial No.	L-2530-51A
V-Maneuver Speed	164 mph	Horsepower	200 HP
V-f Flap Ext. Speed	110 mph	Max RPM	2700
V-ne Never Exceed Speed	216 mph	Fuel grade	100/130 LL
		Propeller (Prince fixed pitch)	P-Tip 68”D X 80”P
MAIN LANDING GEAR		**NOSE LANDING GEAR**	
Type	One Piece fixed Alloy Aluminium	Type	Fixed Fabricated Steel /Aluminium
Wheels	Matco 6”	Wheel	Free Castoring Matco 5”
Tyres	Air Trac 6.00 x 6		
Brakes	Toe Actuated Disk / Caliper Hyd.Piston	Tyre	Alloy Alum. Air Trac 5.00 x 5
Pressure	33 PSI (230 Kpa)	Pressure	29 PSI (200 Kpa)
PERFORMANCE			
Top Speed (sea level)	_____ mph	Rate of climb (average)	_____fpm
Cruise Speed (sea level)	_____ mph	Take off roll	1000 ft (303m)
Stall Speed (clean)	_____ mph	…..over 50 ft obstacle	1200 ft (363 m)
Stall Speed (landing)	_____ mph	Landing roll	1300 ft (394 m)
Range with reserve	_____miles	Ceiling	21 000 ft

- **Cockpit / Instrument panel layout**

1. Air Vent (Pilot)
2. Fuel gauge
3. Hobbs
4. Suction gauge
5. Turn gyro and slip indicator
6. Air speed indicator
7. Direction gyro
8. Artificial horizon
9. Lift Reserve indicator – Dwyer Minihelic 2
10. Micro-Encoder flight instrument & mode “C” encoder
11. GPS – Garmin 90
12. Compass - Airpath
13. RST Audio selector panel / Intercom
14. Icom IC-A200 com radio
15. Narco Com 11A
16. Terra TRT-250 D transponder
17. Icom IC-A22E V.O.R. receiver
18. Elevator trim indicator
19. Elevator trim control
20. GPS serial data port
21. Micro-Monitor engine monitoring instrument
22. EGT/CHT cylinder selector
23. Micro-Monitor audio alarm
24. Mini-Disk audio player
25. ELT remote controls
26. Circuit breakers
27. Voltage regulator warning indicator
28. Voltage regulator test button
29. Air Vent (Co-Pilot)
30. Park Brake control
31. Cabin Heat control
32. Throttle control
33. Mixture Control
34. Storage area
35. Fuel Selector
36. Flap Actuator
37. Headset jack points
38. Pilot stick grip with trim, frequency swap and P.T.T. buttons
39. Cigarette lighter/12v power supply
40. Panel lights dimmer
41. Switches – panel lights, nav. lights, landing lights, strobe, pitot heat, avionics, fuel pump, master, ignition.
42. Overhead Air Vents
43. Data plate
44. Panel flood lights
45. Speaker
46. Fire Extinguisher
47. Carbon Monoxide detector

2. TECHNICAL DATA

- **Engine**

Type: Lycoming IO-360 A2B
Serial no: L-2530-51A
Rated horsepower: 200 HP @2700 RPM
Firewall mounted oil cooler: Aero Classic 9 fin
Oil Filter: Internal filter screen
Oil cooler: Aero Classic 9 fin 1009-005
Air Filter: 60 PPI (Pores per inch) Polyester filter foam
Electric fuel pump: Airflow Performance
Mechanical Fuel pump: LW-15473
Spark plugs: Champion REM38E (X8)
Magneto (left): Bendix S4LN-1227, Serial No. 987172
Magneto (right): Bendix S4LN-1209, Serial No. 967420
Vacuum pump: Edo-Aire dry air pump IU228-004, Serial No. 6608
Fuel Injection: Bendix NSA-5AD1, Serial No. 12842-38

- **Propeller**

Propeller type: Fixed pitch, wood/composite Prince P-Tip
Serial no: 5125P68AT80LK
Diameter: 68”
Pitch: 80”
Prop extension: 3.1”
Bolt torque: 300 lbs/in (AN8-60 bolts)

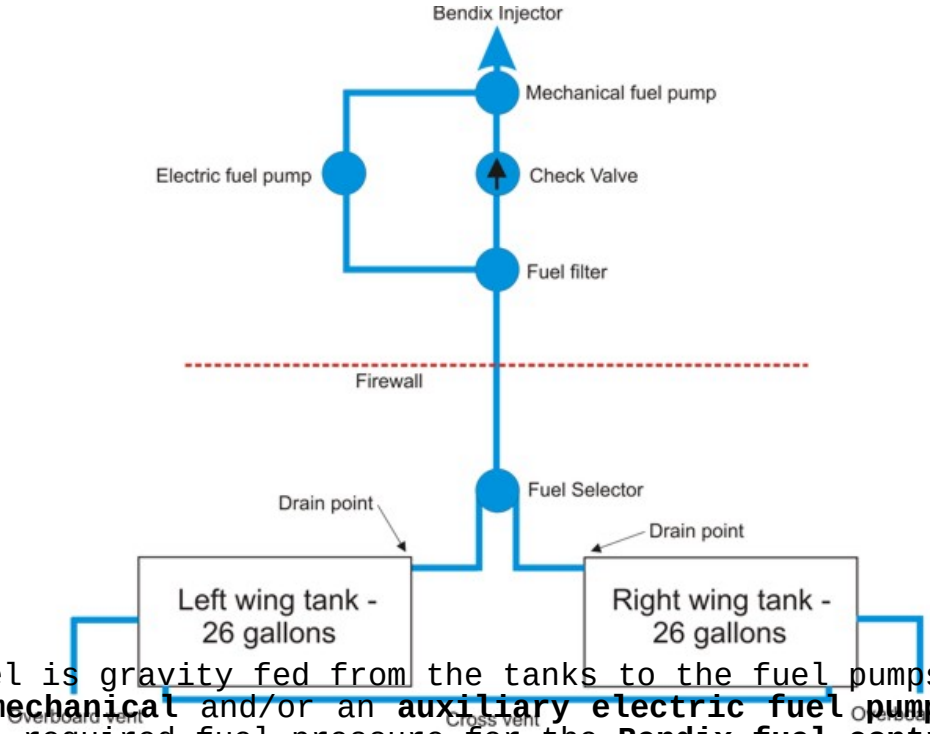
- **Landing gear / brakes / tyres**

Main landing gear : Single spring aluminum – fixed
Nose gear: 4130 steel castoring type with integral shock absorber and springs
Main tyres: Air Trac 6.00 X 6. Inflate to 33 PSi
Nose tyre: Air Trac 5.00 X 5. Inflate to 29 PSi
Brakes: MATCO – separate hydraulic systems for each wheel. Master cylinders are connected to the brake pedals on the pilot side only. A common reservoir is located in the engine bay on the top left of the firewall. A Park Brake actuator is positioned on the firewall and activated via a push/pull cable on the instrument panel.

- **Quantities – Fuel and Oil**

Fuel: 26 gallons (98 litres) usable in each wing tank. 52 gallons in total
51.5 gallons usable (195 litres) Use only 100LL
Oil : 8 U.S. quarts maximum, 6 - 7 quarts normal.
Use Shell Straight 100 for first 25 hours and W100 after run-in

- **Fuel system schematic**



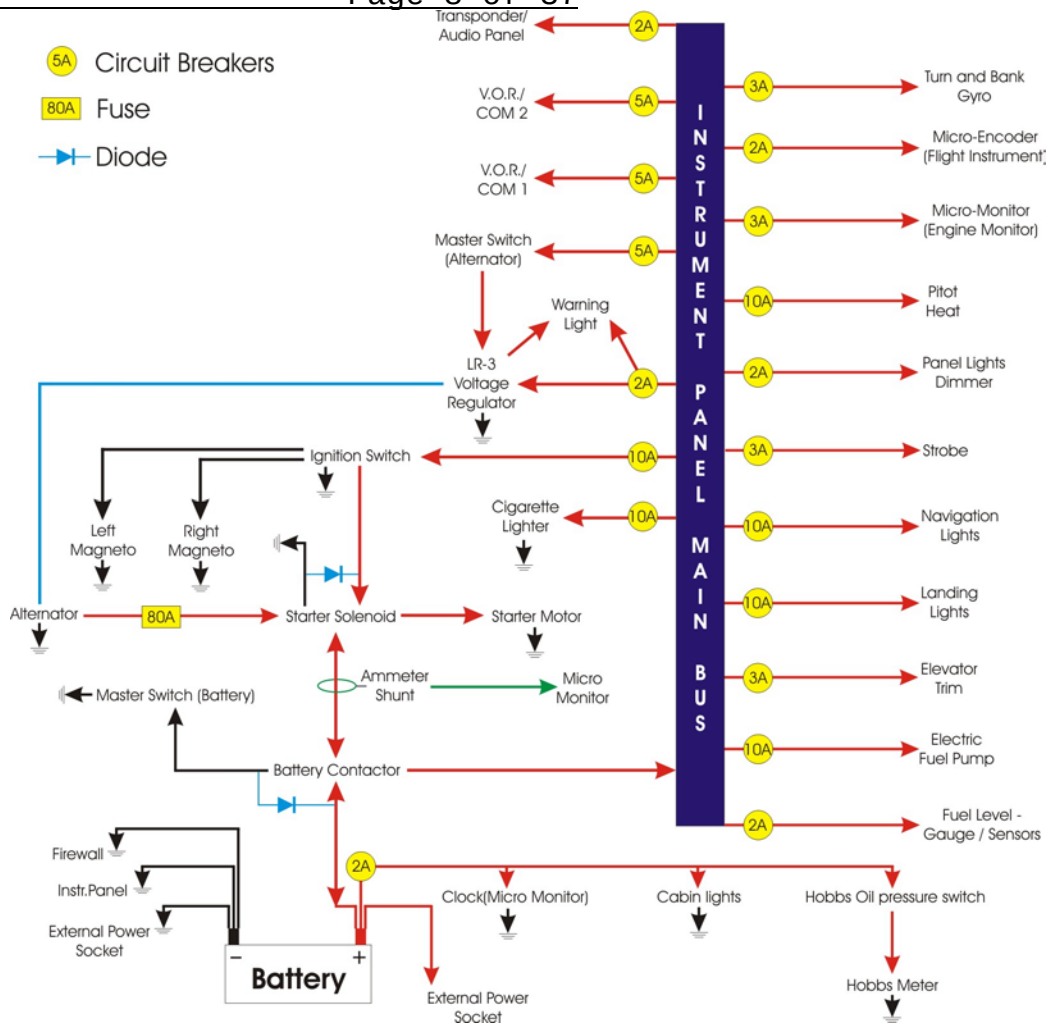
Fuel is gravity fed from the tanks to the fuel pumps
A **mechanical** and/or an **auxiliary electric fuel pump** provide the required fuel pressure for the **Bendix fuel control unit**
A **filter** strains the fuel before it enters the pumps
A mechanical **3-port selector valve** is used to select which tanks is being used
Each tank has a **vent** as well as a cross vent between them

- **Control systems**

All control surfaces are **100% balanced** with counterbalance weights, with the exception of the flaps. They are all attached to their respective flying surfaces by aluminum piano hinges.
The **rudder pedals** are connected to a bellcrank at the Station 189 bulkhead by stainless steel cables, and activate the rudder via a push rod connected to one side of the bellcrank. Tension on the cables is achieved with the use elasticized chord at the firewall.
Elevator and aileron control is via push/pull tubes and bellcranks, operated from the control stick.
A “ handbrake” situated between the front seats manually activates flaps.

Control Movements:
Elevator: +25 -16
Ailerons: +14 -9
Rudder: L=24 R=30
Flaps: 0/12/28

- **Electrical System schematic**



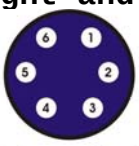
Alternator: 15 Volt DC, 40 amp Motorcraft
Battery: Genesis Hawker Energy, 12v, 26Ah
Voltage regulator: B & C Specialty Products LR-3B
External power: Piper type socket

- **Wiring description and pin configurations**

Cable No.	Location	Description
3	Panel Left	Ground supply from Master Switch to Battery Contactor
4	Panel Left	Positive supply from Battery to Overhead lights
5	Panel Left	Positive supply from Battery to Micro-monitor clock
6	Panel Left	Positive supply from Battery to Hobbs oil pressure switch
7	Panel Left	Spare wire to Overhead console – yellow
-	Panel Left	Outside Air temperature sensor from Micro-encoder
-	Panel Left	Spare wire to overhead console – red
-	Panel Left	Main positive power feed from Battery contactor to Starter contactor
-	Panel Left	Main ground wire from Battery to Firewall
-	Panel Left	Ammeter shunt cable to Micro-monitor
-	Panel Left	Positive supply to Starter Contactor from Ignition switch
-	Panel Left	Right magneto
-	Panel Left	Left magneto
-	Panel Left	Panel lights dimmer feed to overhead console
-	Panel Left	Positive supply from Hobbs pressure switch to Hobbs meter

Cable No.	Location	Description
2 and 22	Firewall Left	EGT and CHT for cylinder 2
4 and 44	Firewall Left	EGT and CHT fro cylinder 4
-	Firewall Left	Positive supply to Fuel pump
-	Firewall Left	Ground supply to Fuel pump
-	Firewall Left	Positive feed to Starter contactor
-	Firewall Left	Left mag
1 and -	Firewall Right	EGT and CHT fro cylinder 1
3 and 33	Firewall Right	EGT and CHT for cylinder 3
-	Firewall Right	Alternator field from LR-3 voltage regulator
-	Firewall Right	Fuel flow sensor feed to Micro-monitor
-	Firewall Right	Positive supply and return to Hobbs pressure switch
-	Firewall Right	Oil pressure sender to Micro-monitor
-	Firewall Right	Fuel pressure sender to Micro-monitor
-	Firewall Right	Right mag
-	Firewall Right	Oil temp sensor feed to Micro-monitor
8	Panel Right	Ground supply to tail and strobe lights
-	Panel Right	Ground wire to main panel ground bus from battery
-	Panel Right	Positive feed from battery contactor to circuit breakers bus
10	Panel Right	Mac Servo connection from panel to Elevator
11	Panel Right	Positive supply from switch to Strobe
12	Panel Right	Positive supply from switch to Tail light
-	Panel Right	Static Air hose
-	Panel Right	Micro-monitor – CHT, EGT, Oil temp, Oil press, Fuel press, Fuel flow
30	Panel Right	Overhead console ground
31	Panel Right	Positive feed from dimmer to overhead console and compass
32	Panel Right	GPS Antenna
-	Panel Right	Speaker feed to overhead console
35	Panel Right	Com 1 Antenna
351	Panel Right	Com 2 Antenna
41	Panel Right	Fuel pump ground
54	Panel Right	Positive feed to fuel pump
53	Panel Right	Alternator field from Voltage regulator
36	Panel Centre	Left filler cap ground
37	Panel Centre	Right filler cap ground
38	Panel Centre	Pitot Heat ground
39	Panel Centre	Left fuel sender ground
40	Panel Centre	Right fuel sender ground
42 & 43	Panel Centre	Landing light grounds
44 & 45	Panel Centre	Nav. Light grounds
46 & 47	Panel Centre	Landing lights positive
48 & 49	Panel Centre	Nav. lights positive
50 & 51	Panel Centre	Fuel level sender positive
52	Panel Centre	Pitot heat positive
55	Panel Centre	Mac Stick ground supply
56	Panel	Frequency flip-flop – Mac Stick to Com 1

	Centre	
57	Panel Centre	Pilot mic key from Audio panel to Mac stick
58	Panel Centre	Pilot mic key from Audio panel to microphone jack
59	Panel Centre	Co-Pilot mic key
60 & 61	Panel Centre	Fuel level sensor signal wires from tanks to gauge
62 & 63	Panel Centre	Mac trim – up and down from Mac stick to relay
64	Panel Centre	Mac Stick – spare
65	Panel Centre	Headphones – Jacks to Audio panel
66	Panel Centre	Co-Pilot mic – Audio panel to jack
67	Panel Centre	Left passenger microphone – Audio panel to jack
68	Panel Centre	Right passenger microphone – Audio panel to jack
69	Panel Centre	Pilot microphone – Audio panel to jack
-	Panel Centre	Pitot tube
-	Panel Centre	LRI – 2 X hoses
-	Panel Centre	Transponder Antenna
-	Panel Centre	V.O.R. Antenna
Mac Stick Molex connector pin configuration (Under pilot seat)		
Pin 1		Ground
Pin 2		Trim Up
Pin 3		Trim Down
Pin 4		P.T.T.
Pin 5		Frequency select
Pin 6		Spare
GPS Serial port		
Pin 2	white	Data send from GPS to computer
Pin 3	brown	Data receive into GPS from computer
Pin 5	black	Ground
Tail light and strobe connector on vertical fin spar		
Pin 1		Positive to tail light
Pin 2		Ground to tail light
Pin 3		Screen – strobe
Pin 4		Ground – strobe
Pin 5		Positive – strobe
Pin 6		Signal - strobe
Wing route Molex connectors		
Pin 1		Pitot Heat ground (left wing only)
Pin 2		Nav. Lights ground
Pin 3		Fuel senders ground
Pin 4		Landing lights ground
Pin 5		-
Pin 6		-
Pin 7		Signal from fuel senders
Pin 8		Filler cap ground
Pin 9		Pitot Heat – positive
Pin 10		Nav. Lights – positive
Pin 11		Fuel senders – positive
Pin 12		Landing lights - positive



Socket on vertical spar as viewed from the rear

- **Avionics**

Radios: ICOM A200 and Narco Com 11A
VHF antenna: Antenna for the Icom is mounted inside the vertical stabilizer and for the Narco, it is in the fuselage aft of the strobe power pack.
V.O.R.: Icom ICA22E. Antenna is under the baggage compartment carpet
G.P.S: Garmin GPS90.Antenna is in the overhead console
Transponder: Trimble Terra TRT 250 D. Antenna is under the co-pilot seat
Altitude Encoder: Rocky Mountain mode " C" Micro-Encoder
Intercom: Included in the RST Audio panel. Headset jacks are situated between the front seat backs on the top of the center seat support.
ELT: Ameriking AK 450 – situated near the battery, with panel mounted remote

- **Instruments**

Air speed indicator: Standard analogue indicator, as well as the Micro-Encoder digital airspeed indicator
Altimeter: Rocky Mountain Micro-Encoder
Vertical Speed Indicator: Rocky Mountain Micro-Encoder
Tachometer: Rocky Mountain Micro-Monitor
Compass: Air Path
Turn Gyro: Electrical gyro, incorporating a slip indicator
Fuel pressure and Fuel flow: Rocky Mountain Micro-monitor
Oil pressure: Rocky Mountain Micro-monitor
Oil temperature: Rocky Mountain Micro-monitor
Cylinder head temperature: 4 sensors and selector switch– Micro-monitor
EGT: 4 sensors and selector switch – Micro-monitor
Voltmeter and Ammeter: Rocky Mountain Micro-monitor
Fuel level indicators: Dual Sky Sports gauge with 1 Capacitance sensor in each tank.
Outside Air Temperature: Rocky Mountain Micro-encoder
Interior Air Temperature: Rocky Mountain Micro-monitor
Vacuum gauge: 1" UMA 3-200-12
Vacuum Gyro Instruments: Sigma-Tek Artificial Horizon and Direction Indicator
Lift Reserve Indicator: Dwyer Minihelic II pressure gauge P/N 2-5002

- **Lighting**

Strobe light and nav. lights: One red (left) and green (right) on each wing tip. A white taillight, situated on the trailing edge of the rudder, is also activated when the wing tip nav. lights are switched on. One fuselage mounted power unit for the strobe light is situated behind the Station 139 bulkhead, while the strobe light itself is situated on the top of the rudder.

Landing lights: These are situated just inboard of the wing tips, along the wing leading edge. They use automotive style 12volt, 50watt Halogen globes

Interior Lights: Situated in the overhead console. There is one general utility light and two rear passenger reading lights. Miniature flood lights are also housed in the forward section of the console for general panel lighting.

- **Paint**

  This aircraft has been sprayed with Standox 4:1 filler primer, Polyfiber UV Shield and Standox 2K top coat. The colours used are as follows:
  2K white (MIX 010), Green metallic base coat (AC 530), Blue metallic base coat (AC356) and 2K clear coat.

3. DESCRIPTIONS AND OPERATIONS

- **Pitot / Static System:**

  A heated Pitot tube is situated under the left wing. It is connected to both the analogue and the digital airspeed indicators. Prior to flight, it must be checked to make sure there are no blockages to the air inlet. Foreign particles can be prevented from entering the pitot system by the use of the " Remove Before Flight" cover when the aircraft is not flying. This protective cover MUST be removed during the pre-flight inspection. There are two static vents that provide the flight instruments with ambient pressure. These vents are " teed" at the source and are located on both sides of the fuselage, on the waterline, just behind the Station 139 bulkhead. Care must be taken not to block these vents, especially during washing or polishing the aircraft.
  A rocker switch on the switch panel operates **Pitot heat.** This feature should be used in icing conditions to prevent ice blockage of the pitot inlet.
  In addition to the standard Pitot / Static system, this aircraft also features a **Lift Reserve Indicator**. The probe is located under the right wing at between 15 % and 30% of the wing chord (just behind the aileron bellcrank access cover) and has two ports – a high pressure and a low pressure. The high pressure port on the probe is the top-most of the two ports, the bottom port being the low pressure feed. Two tubes connect the probe directly to the HP (high pressure) and LP (low pressure) inlets on the panel-mounted gauge. The gauge is clearly marked with red (stall), yellow (approach / climb) and green (normal) arcs. The probe angle is set correctly when the LRI needle matches the black line in the red arc at the moment of touchdown during a full stall landing.

- **Electrical System:**

A 14-volt, direct current system powered by an engine-driven alternator, supplies electrical energy. The 12-volt **battery** is located behind the rear baggage bulkhead. Power is supplied to all electrical circuits via a bus bar, located on the far right of the instrument panel.
A split-rocker type **Master switch** is located on the main switch panel. The right half of the switch (Battery) controls all electrical power to the aircraft via a master solenoid situated at the rear near the battery. The left half of the switch (Alternator) controls the Alternator field. Normally, both sides of the switch are used simultaneously, however, in the event of alternator failure, it is possible to switch off the alternator field, whilst leaving the battery switched on. This means that the entire aircraft's electrical requirements are then placed upon the battery. Conversely, it is not possible to switch off the battery and leave the alternator in circuit.
The Rocky Mountain **Micro-Monitor** monitors the electrical buss current draw and voltage. It displays the current draw/load on the alternator as well as the main bus voltage. No current monitoring of the battery output is possible, should the alternator be switched off.
The aircraft is equipped with an automatic over-voltage protection system. In the event of an over-voltage condition, the **LR-3 voltage regulator** shuts down the alternator field and the warning light (on the circuit breaker panel) illuminates. If the bus voltage

drops below 12.5 volts, this same indicator will flash until the situation has been rectified.
The majority of the electrical circuits in the aircraft are protected by push-to-reset **circuit breakers**, situated on the far right panel of the instrument panel. Exceptions to this are the Hobbs meter, Micro-monitor clock and interior lighting. The circuit breaker for these is situated on the battery box. Always be sure that, in the event of a circuit breaker tripping, the problem is rectified before resetting the circuit breaker.
An **external power socket** is situated on the lower left part of the fuselage, just forward of the Station 139 bulkhead. This is permanently live and directly connected to the battery. Using the custom manufactured jumper leads, this socket can be used to assist in starting the engine in the event of the aircraft battery being flat. A battery charger could also be connected to this socket.

- **Fuel System**

Forward of the main spar of each wing is a " wet wing" type fuel tank. Fuel exits the tanks through **finger strainers** and then flows to a **LEFT-RIGHT-OFF-OFF selector valve** situated in the cockpit. Depending upon the setting of the selector valve, fuel from the left or right tank flows through a firewall mounted **filter**, after which it either flows through a **high pressure electric fuel pump**, or a **one-way check valve** en-route to an engine mounted **mechanical fuel pump**. From here, fuel is distributed to the engine

cylinders via a fuel control unit and manifold. Prior to take-off, it is wise to check that both the mechanical and electrical pumps are operational. During take-off and landing and whenever changing fuel tanks, the electric pump should be switched on to reduce the risk of fuel starvation in the event of a mechanical pump failure, or in the event of air getting into the fuel system.

Each tank has a capacity of 26 gallons, of which 25.5 gallons are usable. It is not practical to measure the time required to consume all the fuel in one tank, and, after switching to the opposite tank, expect equal duration from the remaining fuel. A vent line interconnects the airspace in both fuel tanks and, therefore, some sloshing of fuel between tanks can be expected when the tanks are nearly full and the wings are not level. Prolonged steep turns, with the low wing's tank selected should be avoided due to the possibility of the fuel tank outlets being uncovered, especially during low fuel situations. Each tank has a **vent line** that exits the underside of the wing, at each wing tip. To prevent fuel starvation, it is vital that these vents are confirmed to be clear of blockages during the pre-flight inspection. The **cross-vent** line between tanks is a safety measure just in case one vent does get blocked. The tank with the blocked vent is then able to draw air from the opposite tanks vent.

Each **filler cap is grounded** to the firewall, which in turn is directly connected to the nose gear. This means that the ground wire that is attached to the nose gear upon re-fuelling, has a direct link to the filler cap, thus enabling the filler nozzle to ground itself against the filler cap housing, thereby reducing the risk of static buildup and sparking during re-fuelling.

Capacitance type fuel sender units situated in each tank operate the **fuel gauge**. Due to the nature of their installation, they will tend to indicate " FULL" even when the tanks are only two-thirds full. Only then will they start indicating the dropping fuel level in each tank. As a backup to this gauge and a more accurate method of monitoring fuel usage, the Rocky Mountain Micro-Monitor fuel flow indicator should be continuously monitored. Fuel pressure is also displayed by the Micro-Monitor and upper and lower alarm limits can be programmed into the unit. (See the Micro-monitor operations manual)

- **Lighting Systems**

External lighting consists of 2 landing lights (one on each wing), **wing tip navigation lights**, a white **tail light** (on the rudder trailing edge) and a single **strobe** (on the top of the rudder). All the lights are operated via switches on the Instrument panel. The high intensity strobe light will enhance anti-collision protection, however, it should be turned off when taxiing in the vicinity of other aircraft, or during flight through cloud, fog or haze.

Interior lighting is controlled by an on/off switch and a **dimmer**, and consists of panel **flood lights** (in the overhead console) in addition to the integrated lighting of some instruments. For the rear passengers, **map lights** are situated in the overhead console.

- **Cabin Heating / Ventilation**

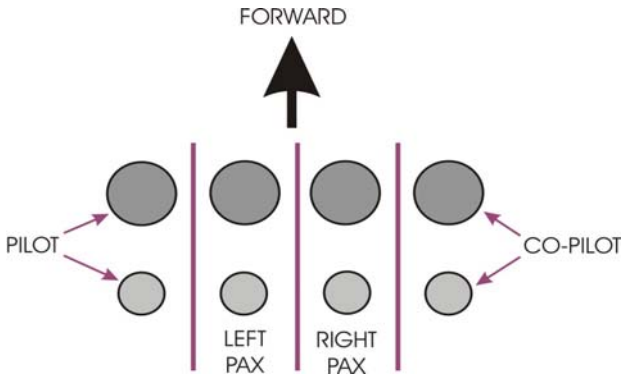
  Outside air is ducted into the cabin via 3 sources – **eyeball vents** on the pilot and the co-pilot side of the instrument panel, and eyeball vents positioned in the overhead console. The overhead vents are fed from a Naca duct on the right hand side of the vertical fin.
  Cabin Heat is adjusted by a **push/pull knob** situated in the center of the instrument panel. The air enters the cabin via a vent in the firewall just to the left of the co-pilot's feet. Due to the fact that hot air is sourced from a heat muff on the exhausts, there is the risk of Carbon Monoxide entering the cabin should a hole develop in the exhaust. It is therefore wise to keep an eye on the **Carbon Monoxide detector** and rectify any exhaust gas leakage problem as soon as it becomes apparent.

- **Seatbelts**

  All 4 seats are equipped with adjustable **3-point lap and shoulder harnesses**. Once the two parts of the seatbelts have been securely fastened (using the quick release buckles), the shoulder portions of the harnesses should be adjusted to permit the occupant to lean forward enough to sit completely erect, yet be tight enough to prevent excess forward movement and contact with objects during sudden deceleration. Also, the pilot will want the freedom to reach all the controls easily.

- **Radios and Intercom**

  A 4-place intercom is incorporated into the RST audio panel. All 4 headsets can be plugged into the aircraft system via the jacks situated in the center support console between the front seats. This diagram shows the jack layout:



  A Mini-Disk music player is situated in the small compartment under the Micro-Monitor. This comes up as " aux" on the audio panel and can be routed to all headphones or the speaker in the overhead console. Music is dimmed when the radios are active, and the pilot can isolate himself from the rest of the passengers.
  The pilot's control stick has a PTT button on the front. If headphones with integrated PTT buttons are used, they need to be plugged in to either the pilot's or the co-pilot's jack points to enable this option. The other jack points do not have PTT functionality.

- **Flaps / Trim**

  The flaps are manually operated by means of the " handbrake" style lever between the front seats. The full down position is 0 degrees, the second position is 12 degrees and the third position is 28 degrees. It is not required to use flaps for take-off. Maximum flap deployment speed is 110 mph (white arc).
  Electric elevator trim is controlled by either the buttons on the top of the pilot's stick, or by the rocker switch situated on the Instrument panel. An indicator next to the rocker switch shows the trim tab position.

- **Brakes / steering/ landing gear**

  Ground steering is achieved by using differential braking to turn the aircraft. The castoring nose wheel simply follows the aircraft heading. It is important to check the castoring nose wheel friction nut on a regular basis to ensure that the pin holding the nut in place is not damaged or missing. This nut should always be tightened such that a force of about 20 lbs is required to move the nose wheel from side to side. The rod-end bearings on the " H" bracket at the lower mounting point should also be checked for security and for lubrication on a regular basis. There is very little maintenance possible on the main landing gear, with the exception of the brake pads, discs and brake lines. To operate the park brake – press hard on the toe brakes and pull park brake handle to lock brakes. To release, simply push handle back in again.

- **Rocky Mountain Instruments**

  The two digital instruments on the panel are the Micro-Encoder (flight instrument) and the Micro-Monitor (engine instruments). In the event of clarification of operation, or programming, refer to their respective operational manuals.

- **Engine**

  The Lycoming IO-360 A2B is a fuel injected, fixed pitch propeller, 4 cylinder, air cooled aircraft engine. Fuel is supplied by a Bendix fuel injection system and ignition is taken care of by dual Bendix 1200 series magnetos, firing 2 spark plugs per cylinder. The engine is rated at 200 HP at 2700 RPM.
  EGT: At a maximum of 75% cruise power, best power cruise is at 100F rich of peak EGT and best economy is achieved when operating at peak EGT.
  CHT: Normal CHT values are between 350F and 435F. It is best to try and keep the CHT below 400F. Never exceed 500F.
  Oil Temps: Normal oil temps are between 165F and 220F.
  Refer to the Lycoming IO360 A2B operator's manual for further details on the engine description and operation.

4. OPERATING LIMITATIONS

- **General Maneuvers**

  This aircraft is designed to operate in NORMAL category. Design load factor is 2.9G positive and 2.2G negative. This category is applicable to airplanes intended for non-aerobatic operations.
  Maximum number of occupants is 4, and maximum gross take-off weight, with full fuel tanks, is 2500lbs. 200lbs of this weight should be fuel related, thus reducing the maximum structural landing weight of the aircraft to 2300lbs.

- **Airspeed limitations**

Never exceed (Vne):	188 kts (216 mph)
Maximum Flap Speed (Vfe):	96 kts (110 mph)
Maneuvering speed (Va):	143 kts (164mph)
Stall speed – no flap:	_____ mph
Stall speed – flap:	_____ mph

- **Airspeed indicator markings**

Green arc:	143 kts (164 mph)
Yellow arc:	143 – 188 kts (164 – 216 mph)
White arc.	96 kts (110 mph)
Red line:	188 kts (216 mph)

- **Lift Reserve Indicator markings**

Red arc:	Stall/dangerous
Marking in red arc:	Landing position
Yellow arc:	Climb and approach
Marking in yellow arc:	Ideal approach position
Green arc:	Normal

- **Engine operation limitations**

Rated Maximum continuous operation	200 HP @ 2700 RPM
Recommended Max. For Cruising	150 HP (75%)
Recommended Min for Idle	700±25
Maximum Take-off	Full Throttle
Maximum Continuous	Full Throttle

Oil Sump capacity:	8 Quarts
Normal capacity:	6 - 7 Quarts

Oil Pressure:

Idle, minimum	10 psi
Normal operation	30 to 60 psi
Maximum:	100 psi

Oil Temperature:

Normal:	165F – 220F
Minimum for Take-off	75 F
Maximum allowable	240 F

Cylinder Head Temperature:

Normal range:	350F – 435F
Minimum for Take-off	200 F

Maximum allowable	500 F
Recommended Max at Cruise	380 F

EGT:

Best Power Cruise: (75% power max)	100F rich of peak
Best Economy: (75% power max)	At peak EGT

Ignition spark advance: 25 deg

- **Weight and Balance limitations**

Max take-off weight (with full fuel): 2500 lbs (1133 kg)
Max take-off weight (without full fuel): 2400 lbs (1089 kg)
Max forward c.g: STA 38.25″ (13% of chord)
Max aft c.g: STA 45.56″ (26% of chord)

- **Passenger warning**

The following placard is in full view on the instrument panel:

WARNING
AMATEUR-BUILT-AIRCRAFT
This aircraft is not required to comply with all the safety regulations for type Certified aircraft. (It exceeds them).
To be operated for sport or recreational purposes only.
You fly in this aircraft at your own risk.

5. NORMAL OPERATING PROCEDURES

- **Pre-Flight Inspection**

Visually check the aircraft for general condition during walk-around inspection. In cold weather, remove even small accumulations of frost, ice or snow from wing, tail and control surfaces. Also make sure that control surfaces

contain no internal accumulations of ice or debris. If night flight is planned, check operation of all lights and make sure a torch/flashlight is available. Remove the pitot cover.

Check Point 1 (Cabin)

a. Remove control stick lock
b. Check ignition switch " off"
c. Turn on Master and check fuel level gauge
d. Check that fuel selector valve is on fullest tank
e. Switch on all exterior lighting and pitot heat
f. Lower flaps
g. Retrieve fuel drainer

En route to the tail, check the external power socket for security and contamination a check static port for contamination. Also check rear windows for damage

Check Point 2 (Tail)

a. Disconnect tail tie down (if installed)
b. Check control surfaces and trim tab for freedom of movement and security.
c. Check push rod attachments, including trim tab
d. Ensure that tail and strobe lights are operational and undamaged

En route to flaps, check static vent for contamination and rear windows for damage

Check Point 3 (Right Flap)

a. Check control surface movement and security
b. Check actuator arms for contamination, freedom of movement and security

Check Point 4 (Right Aileron)

a. Check for freedom of movement and that control stick and opposite aileron move accordingly
b. Check counterbalance weight and control surface security

Check Point 5 (Right Wing tip)

a. Check that the navigation light is operational
b. Check fuel tank vent for contamination and damage
c. Check landing light lense for damage and globe for operation
d. Check landing light inspection cover for security and damage

Check Point 6 (Right Mid wing)

a. Check wing leading edge for damage
b. Remove tie down (if installed)
c. Check fuel level in wing tank and secure filler cap
d. Check aileron bellcrank inspection cover for damage and security
e. Check Lift Reserve Indicator pressure sensor for security and contamination

Check Point 7 (Right Wing route)

a. Check Naca duct for contamination
b. Check windscreen for damage and security
c. Check door latches and movement
d. Check belly fairings for security and damage
e. Verify that there is no fluid leakage evident on the belly
f. Check main tyre for inflation, wear and possible brake fluid leakage
g. Drain fuel and check for contamination

Check Point 8 (Nose)

a. Open oil inspection hatch, check oil level (top up if necessary) and re-secure dip stick
b. Visually inspect under the cowl before closing the inspection cover (if possible, check the brake fluid level)
c. Check propeller and spinner for nicks and security
d. Check air intakes for contamination
e. Check nose wheel for security and inflation
f. Check exhaust for security and inspect under the cowl via the exhaust exit area
g. Check cowling fasteners
h. Turn prop by hand through 3 revolutions
i. Check alternator belt for wear and tension

Check Point 9 (Left Wing route)

a. Check Naca duct for contamination
b. Check windscreen for damage and security
c. Check door latches and movement
d. Check belly fairings for security and damage
e. Verify that there is no fluid leakage evident on the belly
f. Check main tyre for inflation, wear and possible brake fluid leakage
g. Drain fuel and check for contamination

Check Point 10 (Left Mid wing)

a. Check wing leading edge for damage
b. Remove tie down (if installed)
c. Check fuel level in wing tank and secure filler cap
d. Check aileron bellcrank inspection cover for damage and security
e. Check pitot for security and contamination and confirm its heater is operational

Check Point 11 (Left Wing tip)

a. Check that the navigation light is operational
b. Check fuel tank vent for contamination and damage
c. Check landing light lense for damage and globe for operation
d. Check landing light inspection cover for security and damage

Check Point 12 (Left Aileron)

a. Check for freedom of movement and that control stick and opposite aileron move accordingly

b.Check counterbalance weight and control surface security

Check Point 13 (Left Flap)

a. Check control surface movement and security
b. Check actuator arms for contamination, freedom of movement and security

Switch off lights, pitot heat, master and retract flaps

- **Starting the engine**

CAUTION… Release starter switch as soon as engine fires. Never engage the starter while the propeller is still turning. If the starter has been engaged for 30 seconds and the engine has not started, release the starter switch and allow the starter motor to cool for 3 to 5 minutes before another starting attempt is made.
CAUTION … Oil pressure indication must be noted within 30 seconds in normal weather. If no pressure is noted within the specified time, stop the engine and investigate the cause.

1. Engage master switch
2. Check indicated battery voltage
3. Select fuel from tank with lowest fuel
4. Push in mixture control to fully rich
5. Open throttle control to 1" forward of closed position
6. Engage the electrical fuel pump until indicated metered fuel pressure reaches 4-6 psi, and switch off after 3-6 more seconds depending on required priming
7. Ensure that propeller area is clear
8. Apply brakes
9. Engage starter until engine fires. If the engine was not primed enough, engage electrical fuel pump as required
10. Check that oil pressure is indicated within 30 seconds
11. Place alternator switch to ON, and check that voltage increases to 14-15 Volt
12. Allow at least one minute warm up at 1000 RPM. Do not exceed 1800 RPM with oil temperature less than 75 F, and CHT < 200 F
13. Place navigation lights and strobe light on as required
14. Before taxiing switch fuel supply to fullest tank and set mixture for taxi

- **Taxiing**

Steering is accomplished by use of differential braking, and rudder deflection

1. Check brakes
2. Check instruments and avionics during taxiing

- **Engine run up**

CAUTION….Oil temperature must be at least 75 F before engine run up.

1. Set the park brake (fully out)
2. Select fuel as for take-off
3. Set throttle to 1700 RPM
4. Check temps and pressures in the green and alternator is charging
5. Set mixture 3 turns rich of too lean

6. Dead cut check on each magneto (50 RPM maximum differential between magnetos and a 150 RPM maximum drop per magneto) CAUTION … If the RPM does not drop, this is indicative of either a failure to ground the magneto, or a significant difference in timing between the magnetos, and must be rectified before flight. After noting the RPM drops and differential, place the magneto switch back to BOTH, and note the RPM increase to 1700.
7. Check suction gauge (4.6 – 5.4 inches of mercury)
8. Check and set Direction gyro to Compass
9. Pull throttle back to idle and check that RPM is less than 900 RPM
10. Set holding RPM

- **Pre-take off checks**

1. Throttle - set friction nut to finger tight
2. Trim – set for take-off
3. Test Controls – correct and free movement
4. Magnetos – both selected
5. Mixture – set for take-off
6. Master – battery and alternator on
7. Pressures and temps – in the green (Oil>75F and CHT>200F)
8. Park brake off
9. Gyros – instruments and suction checked
10. Fuel – correct tank selected, quantities checked, pump switched on and pressure checked
11. Flaps – set for take-off
12. Instruments – set and checked
13. Harnesses – tight and locked
14. Hatches – closed and locked
15. Electrics – circuit breakers, alternator and switches checked and set as required

- **Take-off**

1. Passenger briefing
2. Align D.I. with runway heading
3. Check wind direction
4. Set transponder as required
5. Check temps and pressures
6. Apply full throttle and check RPM
7. Release brakes, and upon rolling, check airspeed indicators for operation
8. Rotate at _____ mph

- **Climb**

1. Throttle – set climb power
2. Airspeed – climb at _____ mph
3. Mixture – set and fuel flow checked, pump off
4. Flaps – retract (if necessary)
5. Landing lights off
6. Temps and pressures in the green

- **Cruise**

1. Throttle – set to required power setting
2. Adjust elevator trim
3. Mixture – lean for cruise fuel flow
4. Change fuel tanks every 30 minutes and monitor fuel flow, fuel levels, temps and pressures and altitude

- **Glide**

  Avoid long descents at a low power setting, which can result in excessive engine cooling. Do not permit cylinder temperature to drop below 300 F for periods exceeding 5 minutes. Best glide speed is _____ mph

- **Prior to landing**

  1. Fuel – select fullest tank and switch pump on
  2. Mixture – set richer as required
  3. Throttle – set for speed as required
  4. Flaps – check speed is below 110mph and apply as required
  5. Instruments – Check temps and pressures
  6. Electrics – Switch on landing lights
  7. Harnesses and hatches – tight and locked

- **Balked landing (Go around)**

  1. Power – full throttle
  2. Flaps – retract to 1st notch
  3. Speed – At 90mph, retract flaps slowly and fully

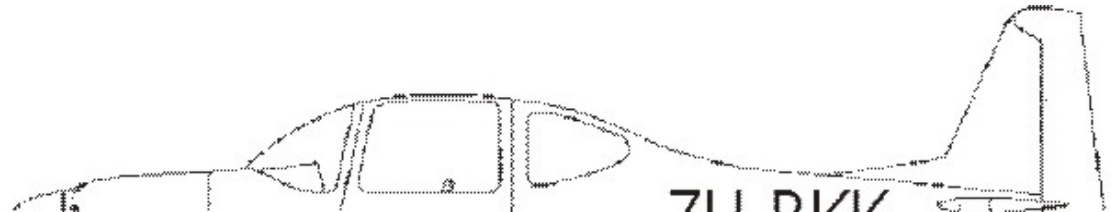
- **After landing**

  1. Electrics – strobes and landing lights off
  2. Mixture – set for taxi and fuel pump off
  3. Flaps - retracted

- **Shut down**

  1. Park Brake set
  2. Throttle – set holding RPM
  3. Instruments – temps and pressures checked
  4. Avionics – switch off
  5. Magnetos – dead cut check
  6. Mixture - idle cut off
  7. Electrics – all switches off, mags off, master off
  8. Secure aircraft – locks, chocks, tie downs and covers
  9. Inspection – check for damages or leaks

6. WEIGHT AND BALANCE



- **Locations of load:**

- **Scale readings for ZU-BKK under various configurations:**

  DATE OF WEIGHING:_____

  PLACE:_____

  SCALE TYPE:_____

	Empty (lbs)	**+ Full fuel (lbs)**	**+ Pilot & Co-pilot(lbs)**	**+ Rear pass. (lbs)**	**+ Baggage (lbs)**
Nose Wheel					
Left Main					
Right Main					
Total					
CG station					

Notes:

_____
_____
_____
_____
_____

_____
_____
_____
_____
_____

- **Loading example 1:**_____

ITEM	WEIGHT (lbs)	STATION (inch)	MOMENT (inch-lbs)
Empty aircraft			
Pilot + Co-pilot			
Rear Passengers			
Fuel (6 lbs / gallon)			
Baggage			
Total			

- **Loading example 2:**_____

ITEM	WEIGHT (lbs)	STATION (inch)	MOMENT (inch-lbs)
Empty aircraft			
Pilot + Co-pilot			
Rear Passengers			
Fuel (6 lbs / gallon)			
Baggage			
Total			

- **Loading example 3:**_____

ITEM	WEIGHT (lbs)	STATION (inch)	MOMENT (inch-lbs)
Empty aircraft			
Pilot + Co-pilot			
Rear Passengers			
Fuel (6 lbs / gallon)			
Baggage			
Total			

Center of Gravity calculation

Empty weight x_____ + Pilot&Co-pilot weight x 39 + Fuel weight x 39 +
Rear passengers x 71+ Baggage weight x 93

_____
_____Total Weight

Conversion table:

1 lb = 0.45 kg
1 kg = 2.2 lbs
1 inch = 2.54 cm
1 cm = 0.39 inch
1 gal = 3.785 litres
1 litre = 0.26 gal

7. AIRPLANE CARE

- **Ground Handling**
  The airplane is most easily and safely maneuvered during ground handling by the tow-bar attached to the nose gear. However, due to the castoring nature of the nose wheel, it may be necessary to apply weight to the rear of the aircraft in order to lift the nose wheel off the ground if it is required to move the aircraft backwards.

- **Mooring**
  Proper tie-down procedure is the best precaution against damage to a parked airplane by wind. The mooring procedure is as follows:
  1. Set parking brake and lock control stick (using seat belt)
  2. Install the tie down fittings into the receptacles under each wing and under the tail
  3. Tie sufficiently strong ropes to these tie-down fittings and secure each rope to the ground
  4. Install pitot tube and LRI probe covers
  5. Fit and secure aircraft cover

- **Windows**
  The Acrylic windshield and windows should be cleaned with an aircraft windshield cleaner. Fine scratches can be polished out using Micromesh or a commercial wax.
  Never use gasoline, benzine, alcohol, acetone, carbon tetrachloride, lacquer thinners or glass cleaner to clean the Acrylic. These materials may attack the plastic and cause it to craze.

- **Paint**
  Generally, the painted surfaces can be kept bright by washing with water and mild soap, followed by a rinse with water and drying with a chamois. If desired, waxing can be done with a good automotive wax. Any touch-ups should be done before the waxing, but after washing.

- **Propeller**
  Small nicks, particularly near the tips and on the leading edges should be filled and sanded as soon as possible.

- **Interior**
  Dust and loose dirt can be removed by regular cleaning with a vacuum cleaner. Soiled upholstery may be cleaned with foam-type detergent. Refrain from using any volatile solvents. Similar cleaning agents as used in the home can be used in the cockpit.

- **Flyable storage**
  Aircraft that are not in daily flight should have the engine started and warmed at least once a week. This process replaces oil that has drained from internal surfaces while standing idle. Warm up should be in such a manner to produce

oil temps in the region of 170F. Maximum CHT's must never be exceeded in ground operation. Keep fuel tanks full to minimize condensation.

8. AIRFRAME AND SYSTEMS MAINTENANCE

- **Every 50 hours**

Remove upper and lower cowls
Remove inspection covers under wings – outboard wing bolt, aileron, landing light Remove rear baggage bulkhead
Remove seat bottoms
Remove wheel pants

Propeller:

1. Check propeller bolt torque and safety wire
2. Inspect spinner condition
3. Check extension for security and cracks

Airframe:

1. Inspect all control linkage rod ends for security.
2. Inspect rudder cable and cable feed-through
3. Inspect all controls surface hinges.
4. Check control surface movements.
5. Inspect main and rear wing bolts
6. Inspect door hinges, and door lock mechanism
7. Inspect rudder pedals and brake cylinders
8. Check brake fluid level
9. Inspect brake tubing
10. Inspect fuel tubing, and selector valve

Landing gear:

1. Check brake pads for wear
2. Check tyres for wear, and damage
3. Grease wheel bearings and " H" bracket rod end
4. Check main castoring castle nut for security
5. Inspect gear legs for cracks, damage, corrosion, and bending

Notes:

_____
_____
_____
_____
_____

_____
_____
_____
_____
_____

_____
_____
_____
_____
_____

- **Annually**

  As per 50 hour check, and in addition:
  1. Functional test of Tachometer
  2. Check ELT battery date. Replace batteries if date expires in less than one year. When replacing the batteries mark the outside of the ELT battery case with the expiration date as indicated on the new batteries.
  3. Check the ELT battery voltage reading
  4. Remove and clean fuel tank screens
  5. Check control surface hinges
  6. Clean vacuum system air filters

- **Bi-annually**

  As per annual, and in addition:
  1. Functional test of altimeter
  2. Functional test of airspeed indicator
  3. Compass swing
  4. Change engine air filter

  Notes:

9.ENGINE MAINTENANCE

- Change engine oil and clean filter screen every 25 hours. Change engine oil at least every 4 months, regardless of hours.
- Clean or replace induction air filter every 50 hours (or sooner in dusty environments) Wash in fuel and then apply K&N filter oil
- Disassemble and clean fuel strainer every 100 hours
- Clean, test and regap spark plugs every 100 hours
- REFER TO IO-360 A2B MAINTENANCE MANUAL FOR FURTHER DETAILS

10.OPERATING CHECKLISTS

- **Before start checks**

PREFLIGHT ---------- Inspection completed
DOORS ---------- Closed and locked
SEATS ---------- Locked in position
HARNESS ---------- Secure
PANEL FOR PANEL CHECK ENSURING:
ELECTRICS ---------- Master on, strobe on, avionics off, circuit breakers in
IGNITION ---------- Key positioned at off
FLAPS ---------- Retracted
FUEL ---------- Contents checked, emptiest tank selected
THROTTLE ---------- Checked, open 1-2 cm
MIXTURE ---------- Checked, set fully rich
THROTTLE FRICTION ---------- Nut loose
PRIMER ---------- Engine primed, primer locked
BRAKES ---------- Park brake set

- **Start checks**

LOOK OUT ---------- Propeller area clear
ENGINE START ---------- Accomplished
THROTTLE ---------- Holding rpm set
OIL PRESSURE ---------- Reading within 30 seconds
MIXTURE ---------- Set for taxi
MAGNETOS ---------- Test individually, dead cut check

- **After start checks**

PANEL FOR PANEL CHECK ENSURING:
ALTERNATOR ---------- On and charging
INSTRUMENTS ---------- Flight instruments, temp+press and suction checked
AVIONICS ---------- Radios and navigation aids on and tested
COMPASS ---------- Checked, D.I. aligned
FUEL -------- Select fullest main tank, pump off, pressure checked

- **Taxi checks**

BRAKES ---------- Checked
INSTRUMENTS ---------- Check serviceability during turns
AVIONICS ---------- Navigation aids tracking

- **Engine run up**

BRAKES ---------- Park brake set
THROTTLE ---------- Holding rpm set
FUEL ---------- Selection as for take-off
INSTRUMENTS ---------- Check temp+press in the green
THROTTLE ---------- Set recommended rpm
MIXTURE ---------- Checked, set for take-off
MAGNETOS ---------- Checked individually and set on both
INSTRUMENTS ---------- Temp+press, volts+amps and suction checked
COMPASS ---------- Checked, D.I. aligned
THROTTLE ---------- Check slow idle, set holding rpm

- **Pre take-off checks**

(Too Many Pilots Go Fly In Heaven Early)

THROTTLE ---------- Friction nut finger tight
TRIM ---------- Set for take-off
TEST CONTROLS ---------- Correct and free movement
MAGNETOS ---------- Selected on both
MIXTURE ---------- Set for take-off
MASTER ---------- Battery and alternator on
PRESSURES ---------- Temp+press in the green
GYROS ---------- Instruments and suction checked
FUEL ---------- Selection, contents, pumps and pressure checked
FLAPS ---------- Set for take-off
INSTRUMENTS ---------- Set and checked
HARNESSES ---------- Tight and locked
HATCHES ---------- Closed and locked
ELECTRICS ------- Circuit breakers, alternator, switches checked and set as required

- **Take-off briefing**

REVIEW SPEEDS ---------- Rotate, Climb, Best glide/Blue line
ABORT PROCEDURE ---------- Sufficient runway remaining
ENGINE FAILURE ------- After T/O, insufficient runway remaining
Speed, Field, Fault, Flap, Final checks
DEPARTURE CLEARANCE ---------- Obtain and review

- **Line up checks**

COMPASSES ---------- D.I. aligned with runway heading, check compass within 5°
STROBES ---------- Selected on
LANDING LIGHTS ---------- Selected as required
WINDSOCK ---------- Wind direction checked
TRANSPONDER ---------- Set as required
INSTRUMENTS ---------- Temp+press checked

- **After take-off checks**

(Safely airborne, can not land back anymore)

THROTTLE ---------- Climb power set
MIXTURE ---------- Set, fuel flow checked
FLAPS ---------- Retracted in stages
FUEL --------- Pumps off, pressure checked, selection as required
INSTRUMENTS ---------- Temp+press in the green
ELECTRICS ---------- Landing lights off

- **TOC, TOD & Field approach checks**(FREDAASS)

FUEL ---------- Contents, selection, pumps and press checked
RADIOS ---------- Correct frequencies selected, ATC clearances obtained, navigation aids tuned- identified-tested
ENGINE ---------- Temp+press checked, power set as required
D.I. ---------- Aligned with compass
ALTIMETER ---------- QNH/QNE set at transition level/altitude
ANTI-ICE ---------- Pitot heat and other systems set as required
SECURITY ---------- Harnesses tight and locked, passengers briefed, no smoking (take-off/landing)
SPEED --------- As required, review approach and landing speeds

- **Pre-maneuvering checks**(HASELL)

HEIGHT ---------- Sufficient to recover above 2000' AGL
AIRFRAME ---------- Trim neutral, flaps and gear as required
SECURITY ---------- Seat locked, harness tight, no loose articles
ENGINE ---------- Fuel pump as required, mixture richend, climb rpm set, temp+press in the green
LOCATION ---------- Clear of aerodromes, controlled airspaces, build-up areas, high ground, water or cloud
LOOK OUT ---------- 360° inspection turn

- **Before landing checks**

BRAKES ---------- Tested, park brake off
MIXTURE ---------- Set richer as required
THROTTLE ---------- Set for speed as required
FUEL -------- Selection, contents, pump and pressure as required
FLAPS ---------- Check speed, set as required
INSTRUMENTS ---------- Temp+press checked
ELECTRICS ---------- Landing lights as required
HARNESSES ---------- Tight and locked

- **Final Approach Checks**

MIXTURE ---------- set as required
FLAPS ---------- As required
SPEED ---------- As required

- **After landing checks**

Stop clear of all runways

ELECTRICS ---------- Strobes off, lights as required, radar and transponder off, pitot heat off
MIXTURE ---------- Set for taxi
FUEL ---------- Pump off, pressure checked
FLAPS ---------- Retracted

- **Shut down checks**

BRAKES ---------- Park brake set
THROTTLE ---------- Holding rpm set
INSTRUMENTS ---------- Temp+press checked
AVIONICS ---------- Radios and navigational aids off
MAGNETOS ---------- Dead cut check
MIXTURE ---------- Idle cut off
ELECTRICS ---------- All switches off, MAGS OFF, MASTER OFF
SECURE AIRCRAFT -------- Locks, chocks, tie-downs and covers
POST FLIGHT INSPECTION --------- Check for damages or leaks

- **Engine failure procedure**

SPEED ---------- Throttle closed, best glide speed, trim
FIELD ---------- Select a field within gliding distance
FAULT ---------- Fuel pump on, change tanks, mixture fully rich, mags on both. Check for power
FLAPS ---------- Use as required to make the field, before landing checks
FINAL CHECKS ---------- Mayday call, pax briefing, crash drill

- **Engine fire procedure**

ENGINE SHUTDOWN -------- Throttle closed, mixture idle cut off, mags off, fuel selector off
CABIN VENTILATION ---------- Vents closed, cabin heat off
EXTINGUISH FIRE ---------- Operate engine fire extinguisher, dive/sideslip aircraft
MAYDAY CALL ---------- On frequency in use or 121,5
LAND ASP ---------- Forced landing procedures

- **Cabin fire smoke**

ELECTRICS ---------- Master off, all electrical switches off
EXTINGUISH FIRE ---------- Use fire extinguisher
CABIN VENTILATION ---- Vents open only after fire extinguished
LAND ASP -------- Nearest suitable airport, R/T failure procedure

11.EMERGENCY PROCEDURES

- **Electrical system malfunctions:**

Malfunctions in the electrical power supply system can be detected by periodic monitoring of the ammeter, however, the cause of these malfunctions is usually difficult to determine. A broken alternator drive belt or wiring is the most common cause of alternator failures, although other factors could cause the problem. A damaged or improperly

adjusted voltage regulator can also cause malfunctions. All electrical problems of this nature constitute an electrical emergency and should be dealt with immediately. Electrical power malfunctions usually fall into two categories:

- **Overcharging**

  After periods of heavy electrical usage (such as starting and taxiing), the battery condition may be low enough to accept above than normal charging during initial flight. However, after 30 minutes of cruising flight, the ammeter should be reading normal. If the charging rate remains above normal on a long flight, it is possible that the battery will overheat. In addition, electronic components could be adversely affected by the higher than normal voltage if a faulty voltage regulator setting is causing the overcharging. To preclude these possibilities, the alternator side of the split Master switch should be turned " OFF" . The flight should be terminated and/or the current drain on the battery minimized as soon as practical because the battery can supply the electrical system for only a limited period of time. If it becomes apparent that the battery voltage is getting too low to operate the electrical system, the alternator switch can be turned on for several minutes at a time until the battery is partially recharged. If the emergency occurs at night, the alternator switch should be returned to the " ON" position just before landing lights will be required for landing.

- **Undercharging**

  If the ammeter indicates a continuous discharge rate in flight, the alternator is not supplying power to the system and should be shut down, since the alternator field circuit may be placing an unnecessary load on the system. All non-essential equipment should be turned " OFF" and the flight terminated as soon as practical.

- **Electric Trim malfunctions:**

  In the event of an electric trim " runaway" malfunction, immediate corrective measures are required as follows:
  1. Minimize the pitch attitude change of the aircraft by applying opposing pressure on the control stick as required.
  2. Assuming that a trim button is sticking, attempt to release the sticking as soon as possible.
  3. If necessary, trim the electric trim circuit breaker and leave disconnected for the remainder of the flight.

- **Rough engine operation or Loss of power:**

  - **Spark Plug fouling**

  A slight engine roughness in flight may be caused by one or more spark plugs becoming fouled by carbon or lead deposits. This may be verified by turning the ignition

switch momentarily from " BOTH" to either " LEFT" or " RIGHT" position. An obvious power loss in single ignition operation is evidence of spark plug or magneto trouble. Assuming that spark plugs are the more likely cause, lean the mixture to the normal lean setting for cruising flight. If the problem does not clear up in several minutes, determine if a richer mixture setting will produce smoother operation. If not, proceed to the nearest airport for repairs using the " BOTH" position of the ignition switch unless extreme roughness dictates the use of a single ignition position.

- **Magneto malfunction**

A sudden engine roughness or misfiring is usually evidence of magneto problems. Switching from " BOTH" to either " LEFT" or " RIGHT" ignition switch position will identify which magneto is malfunctioning. Select different power settings and enrichen mixture to determine if continued operation on " BOTH" magnetos is practical. If not, switch to the good magneto and proceed to the nearest airport for repairs.

- **Engine driven fuel pump failure**

Failure of the engine-driven fuel pump will be evidenced by a sudden reduction in the fuel flow indication prior to a loss of power, while operating from a tank containing adequate fuel.
In the event of a pump failure during take-off, immediately switch on the auxiliary fuel pump switch until the aircraft is well clear of obstacles, after which, maneuver the aircraft for landing.

- **Low oil pressure**

If low oil pressure is accompanied by normal temperature, there is a possibility that the oil pressure gauge or relief valve is malfunctioning. A leak in the line to the gauge sensor is not necessarily cause for an immediate pre-cautionary landing because an orifice in this line will prevent a sudden loss of oil from the engine sump. However, a landing at the nearest airport would be advisable to inspect source of the trouble.
If a total loss of oil pressure is accompanied by a rise in oil temperature, there is a good reason to suspect an engine failure is imminent. Reduce the engine power immediately and select a suitable forced landing field. Leave the engine running at low power during the approach, using only the minimum power required to reach the desired touch down spot.

- **Precautionary Landings**

Before attempting an " off airport" landing, one should drag the landing area at low altitude to inspect the terrain for obstructions and surface conditions, proceeding as follows:

1. Drag over the selected field with 1st notch of flaps and 90 mph airspeed, noting the preferred area for

touchdown for the next landing approach. Then, retract flaps upon reaching a safe altitude and airspeed.
2. On downwind leg, turn off all switches except the master and ignition switches.
3. Approach with flaps at 80 mph
4. Unlock cabin doors prior to final approach
5. Before touchdown, turn ignition and master switches " OFF"
6. Land in slightly tail-low attitude

- **Forced Landings**

If an engine stoppage occurs, establish a flaps-up glide at 85 mph. If time permits, attempt to restart the engine by checking for fuel quantities, proper fuel selector valve position and mixture control setting. Also check that the ignition switch is in the correct position. If all attempts to restart the engine fail and a forced landing is imminent, select a suitable field and prepare for the landing as follows:

1. Pull mixture to idle cut-off position
2. Turn fuel selector valve to " OFF"
3. Turn all switches " OFF"
4. Approach at 90mph
5. Extend wings flaps as necessary within gliding distance of the field
6. Unlock cabin doors
7. Land in a slightly tail-low attitude
8. Apply heavy braking

- **Disorientation in clouds**

Upon entering the clouds, and immediate plan should be made to turn back as follows:

1. Note the time on the clock and the compass heading
2. Initiate a standard rate left turn, holding the turn coordinator symbolic airplane wing opposite the lower left index mark for 60 seconds. Then roll back to level flight by leveling the turn coordinator
3. Check accuracy of the turn by observing the compass heading which should be the reciprocal of the original heading
4. Maintain altitude and airspeed by cautious application of elevator control. Avoid over controlling by keeping hands off the stick and steering only with the rudder

- **Recovery from a Spiral dive**

1. Close the throttle
2. Stop the turn by using coordinated aileron and rudder control to align the airplane in the turn coordinator with the horizon reference line
3. Cautiously apply elevator back pressure to slowly reduce the indicated airspeed to 110 mph
4. Adjust the elevator trim control to maintain a 110 mph glide
5. Keep hands off the control stick, using rudder control to hold a straight heading

6. Check engine operation occasionally, but avoid using enough power to disturb the trimmed glide
7. Upon breaking out of cloud (assuming you're in it), apply normal cruising power and resume flight

- **Engine fire in flight**
  1. Turn fuel selector valve to " OFF"
  2. Pull mixture control to idle cut-off
  3. Turn master switch " OFF"
  4. Establish 120 mph glide
  5. Close cabin heat control
  6. Select a field suitable for a forced landing
  7. If fire is not extinguished, increase glide speed in an attempt to find an airspeed that will provide and incombustible mixture
  8. Execute a forced landing

- **Electrical fire in flight**

  The initial indication of an electrical fire is the odor of burning insulation. The immediate response is to turn the master switch " OFF" . Then close off ventilating air as much as practical to reduce the chances of a sustained fire. If electrical power is indispensable for the flight, an attempt may be made to identify and cut off the defective circuit as follows:
  1. Master switch " OFF"
  2. All other switches (except ignition) " OFF"
  3. Check condition of circuit breakers to identify faulty circuit if possible. Leave faulty circuit deactivated
  4. Master switch " ON"
  5. Select switches on successively, permitting a short time delay to elapse after each switch is turned on until the short circuit is localized
  6. Make sure fire is completely extinguished before opening vents

- **Flight in Icing conditions**

  An unexpected icing encounter should be handled as follows:
  1. Check Pitot heat " ON"
  2. Turn back or change altitude to obtain an outside air temp that is less conducive to icing
  3. Pull cabin heat air control to get maximum defroster heat and airflow
  4. Increase engine speed to minimize ice build-up on the propeller blades
  5. Watch for signs of induction air filter ice and regain power by increasing throttle setting
  6. Plan a landing at the nearest airport. With an extremely rapid ice build up, select a suitable off airport landing site
  7. With an ice accumulation of ¼" or more on the wing leading edges, be prepared for significantly higher stall speed
  8. Leave the wing flaps retracted. With a severe ice build up on the horizontal tail, the change in wing wake

airflow direction caused by wing flap extension could result in a loss of elevator effectiveness

9. Approach at 90 to 100 mph, depending on the amount of ice accumulation
10. Perform a landing in level attitude