ROTORWAY
INTERNATIONAL

EXEC 90

FLIGHT MANUAL

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FLIGHT MANUAL

This helicopter must be operated in compliance with the operating limitations defined in this manual.

Registration No._____

Serial No._____

THIS MANUAL SHOULD BE KEPT IN THE ROTORCRAFT AT ALL TIMES.

REVISED 11/97

WARNING

The construction and operation of "Home-Built Aircraft" of this type is demanding and could inflict serious injury and possible death. No such operation, construction or undertaking should be initiated unless thorough and complete knowledge, preparation and instruction are available and utilized. The seller (and its agents, servants, employees, contractors, successors, and assigns) makes no warranties express or implied regarding the clarity or correctness of the plans, ease of construction or operation, number of building hours required, nor the safety of this aircraft or any part thereof. Furthermore, buyer (and his heirs, administrators and assigns) releases and holds said seller (and its agents, servants, employees, contractors, successors, and assigns) harmless from any and all liability, damages, and causes of action which may be incurred by buyer or any third party as a result of the purchase, use, construction and/or operation of said aircraft (or any part thereof) or plans for same. Buyer assumes all risk and responsibility relative to the construction and/or operation of said aircraft. Seller admits no liability by publication of this warning.

Section 1. General

RotorWay Exec 90 Specifications:

Power Plant.....	RI 162 water cooled four stroke, 162 cu.in.
Seats.....	2
Gross Weight.....	1500 lbs.
Empty Weight.....	925 lbs.
Equipped useful load.....	500 lbs.
Pilot and passenger seat load.....	400 lbs.
Fuel capacity.....	17 U. S. Gallons

Section 2. Limitations

Max. airspeed at sea level, standard day.....115 MPH

Reduce IAS..... 2 MPH for each 1000 ft. density altitude

Max. airspeed in turbulent air.....75 MPH

Max. sideways, rearwards airspeed..... 20 MPH

Fuel Requirements..... 92 Octane (min.) auto fuel or 100 low lead AV gas (100LL)

Carb Heat Use ..... carb heat should be used to keep operating temp. out of yellow warning area on gauge

Solo flight from left seat only (right seat belt must be buckled and passenger collective must be removed).

Flight with (either/or) both doors removed is permitted (all items in the cabin must be secured).

Max. gross weight..... 1500 lbs.

Min. pilot weight (solo operation)..... 150 lbs.

Max. pilot weight..... 210 lbs.

Max. passenger weight.....210 lbs.

Max. pilot and passenger weight..... 400 lbs.

Instrument Markings:

Color code for instrument markings:

GREEN:	Normal operating range
YELLOW:	Cautionary operating range
RED:	Indicates maximum operating limits.The pointer should not enter the red during normal operation.

Voltage:

Green arc..... ..... 12-1/2 to 14-1/2

Oil pressure:

Green arc..... ..... 40-80 PSI
Red line..... below 40 and above 80

Oil temperature:

Low yellow arc..... 100-140 degrees F
Green arc..... ..... 140-210 degrees F
High yellow arc..... 210-240 degrees F
Red line..... 240 degrees F

Water Temperature:

Low yellow arc..... ..... 100-140 degrees F
Green arc..... 140-190 degrees F
High yellow arc..... 190-215 degrees F
Red line..... 215 degrees F

Rotor RPM:

Low red line..... 90%
Low yellow arc..... 90% - 96%
Green arc (100% = 520 RPM)..... 96% - 104%
High yellow arc..... 104% - 110%
High red line.....110%

Engine RPM:

Green arc..... ..... 102% - 108%
High red line.....110%

Airspeed:

Red line..... 115 MPH

Carb Temp:

Low Yellow..... –10 degrees Celsius
High Yellow..... +10 degrees Celsius

Section 3. Normal Procedures

Pre-flight checks:

A. Remove front inspection panel and check:

1. Security and condition of pedals
2. Security of front landing gear bracket
3. Routing and security of all electric wiring
4. Routing and security of the oil pressure and pitot lines

B. Remove cover on the right and left seat backs and check:

1. Torque link for cracks and security
2. Lower bearing on the main shaft
3. Condition of main drive belts
4. Condition of the ignition systems
5. All airframe tubes for cracks

C. Engine area right side check:

1. For oil, fuel, and water leaks, and proper levels
2. Security and routing of hoses, pipes, and wiring
3. Heat shielding for cracks and clearance
4. Security of the rear landing gear brackets

CAUTION: Do not overfill the oil sump. If too much oil is added, the sump must be drained and then re-filled to the proper level. If any oil is spilled, it must be cleaned up before flight.

D. Tail rotor drive check:

1. Condition and tension of drive belts (1-3/8 ±1/8 inch at 10 lbs. pull)
2. Condition of the pulley and bearings
3. Idler pulley swing arm for travel (not bottoming out in bulkhead)

IMPORTANT: New belts will tend to stretch and become loose. Belt tension must be monitored and adjusted fre quently until stretching has stopped.

E. Tail rotor check:

1. Freedom of travel
2. Slider on key
3. Freedom and condition of the rod ends
4. For cracks in the skins around 3/16 retention bolts and pop rivets
5. End play on the blades and security of the snap rings and Pivot bolts

F. Vertical trim fin check:

1. Structural security and angle

G. Horizontal trim fin check:

1. Structural security and angle
2. Security of end caps

H. Tail boom check:

1. For cracks, wrinkles, and structural security

I. Engine area left side check:

1. Oil, fuel, and water leaks
2. Security and routing of pipes, lines, and wiring
3. Condition and tension of the fan drive and main drive belts
4. Clutch and idler pulley
5. Security of the rear landing gear brackets
6. For cracks and security of heat shielding

J. Collective control check:

1. Freedom of travel
2. All linkages for security
3. Throttle roll and butterfly travel in carburetor

K. Cyclic control check:

1. Freedom of travel
2. Bias of the cables and security of rod ends

L. Main drive chain check:

1. Security of the master link
2. Tension of the chain
3 Floor of the oil bath for broken rollers and link plates

M. Rotor system check:

1. Security and wear of the scissors
2. For cracks around the ears of the swash plate and the hood bracket
3. For foreign matter in the bearing seal cavity area
4. To see if washer and snap rings on the drive pin are loose
5. End play between shaft and riser blocks
6. For loose bolts
7. Freedom and condition of both control rods

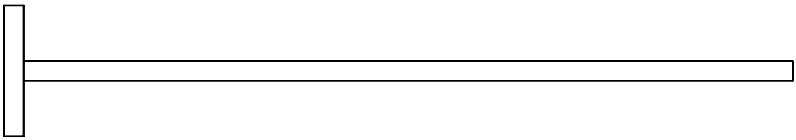
N. Main rotor blades check:

1. All around bolts on retention straps for cracks
2. Bolts for signs of bending
3. Doublers for delamination
4. Blades for wrinkles or cracks near the root end
5. For separation of the skin to spar top and bottom
6. Security of the blade tip end plugs
7. Blade droop for any change

O. Fuel level:

Use a dip hose to check the amount of fuel in the tanks and to verify the accuracy of the fuel gauge.

To calibrate the dip hose, start with the fuel tanks empty and add a measured amount of fuel. Dip the hose all the way into the tank, up to the "T" handle. Take the hose out and permanently mark the fuel level with safety wire. (Insert the wire through the hose, then wrap and tie it securely around the hose.) Repeat the process for additional amounts of fuel. For future reference, record the marks and the corresponding fuel quantity on the dip hose drawing below.



Before starting:

Altimeter	adjust
Seat and shoulder harness	on and adjusted
Doors	secure
Cyclic, collective, and pedals	full travel and freedom of travel

Starting (See switch panel diagram on page 27):

Fuel valve	on
Clutch handle	out
All switches (except alternator)	on
Cyclic and pedals	centered
Collective	3 degrees positive pitch
Main rotor blades	perpendicular to ship
Area	clear
Throttle	closed until engine is turning
Starter	keep engaged until engine is running smoothly

After Started:

Throttle.....	set at 2000 RPM
Oil pressure.....	40-80 psi within 15 seconds
Temperatures.....	rising
Pedals.....	check smoothness and freedom
Cyclic.....	keep centered below 400 RPM
Collective lever.....	check collective

Ignition circuit checks:

1. Alternator switch on. Check voltage.
2. Switch No.1 ignition switch OFF then ON.
   Note that ignition indicator light #1 is operational when switch is on.
3. Switch No. 2 ignition switch OFF then ON.
   Note that ignition indicator light #2 is operational when switch is on.

Run up:

Oil temperature.....	rising
Clutch handle.....	in
Pedals.....	centered
Cyclic.....	centered
Collective lever.....	set 3 to 3-1/2 degrees positive
Throttle.....	set at 100% rotor RPM
Temperature and pressure.....	green
Battery voltage.....	check for charge

NOTE: During run up and run down, engine operations between 2500 and 3000 RPM should be limited due to main drive belt resonance frequency.

Take off:

Pedals..... even to half right pedal
Cyclic..... within 3 inches of center

The pilot should determine the correct control position during take off by noting and responding to the small movements of the aircraft when it becomes light on the skids.

Slowly raise collective, adjusting throttle to maintain rotor RPM in the green.

Economical cruise..... manifold pressure 4 inches less than hover
Rotor RPM (100% = 520 RPM)..... 96-104% maintain in flight

Take off and operation should be conducted per height velocity diagram (see page 18).

During flight, check all instruments for anomalies.

After Landing:

Throttle..... close to idle when light on the skids
Collective lever..... lower to 3 degrees pitch

Shutdown:

Throttle..... idle until temperature is stable
Fuel valve..... off
Clutch handle..... out
All switches..... off (as engine runs out of fuel)

Post flight check:

Master link on chain.....	in position
Swash plate bearing.....	check temperature
Main thrust bearing.....	check temperature
Top secondary bearing.....	check temperature
Tail boom.....	check for wrinkles and temperature of bulkheads
Tail rotor.....	inspect
Vertical stabilizer.....	secure
Main Rotor blades.....	tie to tail boom

Section 4. Emergency Procedures

A. Engine failure General:

1. A change in noise level, a right yaw and low oil pressure may be the first indication of an engine failure.

2. Engine failure at high speed, high power, will result in a tendency for the helicopter to pitch nose up.

B. Engine failure below approximately 8 feet AGL:

1. Maintain level attitude with cyclic.

2. Apply left pedal as required to prevent yawing.

3. Collective pitch should not be reduced by any significant extent.

4. Increase collective just before touchdown to cushion landing.

C. Engine failure between 8 feet and 500 feet AGL:

1. Lower collective lever to maintain rotor RPM. The amount of and duration of collective reduction depends upon the height above the ground at which the engine failure occurs.

2. If height permits, adjust collective to achieve 100% rotor RPM (520 RPM).

3. Use cyclic and collective as required to carry out engine off landing.

4. Maintain heading with pedals.

D. Engine failure above 500 feet AGL:

1. Lower collective to maintain rotor RPM and enter normal autorotation (see page 17).

2. Establish a steady autorotation descent at approximately 65 mph.

3. Adjust collective to keep rotor RPM 100% (520 RPM).

4. After a steady autorotation is established select a landing spot and maneuver as required so the landing will be upwind.

5. A restart may be attempted at pilot's discretion, if sufficient time is available.

6. If unable to restart, turn off unnecessary switches and shut off the fuel valve if sufficient time is available.

7. At about 35 feet AGL, begin a cyclic flare to reduce forward and descent speed. Level at 3 to 5 feet of clearance between the tail rotor and the ground. Allow the aircraft to settle to 30 inches above the ground. At 30 inches, increase collective pitch as necessary to cushion the ground contact.

8. Maintain heading with the pedals.

E. Glide distance configuration:

1. Airspeed approximately 65 mph.

2. Rotor RPM approximately 100% (520 RPM)

3. Increase rotor RPM to 104% when below 500 feet AGL.

F. Engine fire in flight:

1. Enter autorotation.

2. Shut off fuel valve if time is available.

3. Execute an autorotation landing. After landing, if time permits, turn off ignition , instrument and alternator switches.

G. Electrical fire in flight:

1. Instrument and ignition switches on.

2. All other switches off.

3. Land immediately.

4. Extinguish fire and inspect for damage.

(Note: Do not switch ignition off unless the engine has stopped).

H. Air restart procedure:

1. Actuate the throttle as required. Press starter button on the cyclic.

CAUTION: DO NOT ATTEMPT A RESTART IF ENGINE MALFUNCTION IS SUSPECTED UNTIL A SAFE AUTOROTATION IS ESTABLISHED.

I. Tachometer failure:

If the rotor or engine tach malfunctions in flight, use the operational tach to make a normal landing.

J. Tail rotor failure during hover:

1. Failure is usually indicated by a left yaw which can not be stopped by applying right pedal.

2. Immediately close the throttle and perform a hovering power off landing.

3. Keep ship level with the cyclic and increase the collective just before touchdown to cushion landing.

K. Tail rotor failure during forward flight:

1. Failure is usually indicated by right or left yaw which can not be corrected by applying pedal.

2. Immediately enter a shallow descent into the wind.

3. Adjust the collective and the throttle to extend the glide if sideslip is not excessive and the aircraft does not tend to spiral. Cyclic and collective are used to limit sideslip angle.

4. Select landing site and perform a run-on landing using throttle to maintain heading.

L. Engine fire during starting on the ground:

1. Continue cranking to get the engine started which would suck the flame and excess fuel into the engine.

2. If the engine starts, run at 2000 RPM for a short time. Shut down and inspect for damage.

3. If the engine fails to start, turn off the fuel, ignition, and battery switches.

4. Extinguish fire with fire extinguisher, wool blanket, or dirt.

5. Inspect for damage.

Section 5. Performance

Hover in ground effect..... 7000 feet

Hover out of ground effect..... 5000 feet

Service ceiling..... 10,000 feet

Range with maximum fuel at
optimum cruise power..... 180 miles/2hrs.

Normal cruise..... 95 mph

Maximum airspeed..... 115 mph

Autorotation Procedure From Altitude:

For asymmetrical Rotor blades

1. Hold approach airspeed of 65 mph.

2. Maintain rotor RPM of 100% (520 RPM) during steady state descent. Rotor RPM should build by 5-7% during flare, if the flare is performed properly.

3. Flare height is 35 feet AGL for full stop autorotation using 30 degree flare angle. Level aircraft at 3-5 feet of clearance between tail rotor and the ground.

4. During level off, add collective pitch if you are settling too rapidly.

5. Allow aircraft to settle to 30 inch AGL. At 30 inches, add collective pitch as necessary.

Note: This envelope is designed for inexperienced, low time pilots. Out of ground (O.G.E.) hovers are prohibited for all Exec pilots under 150 hours.

HEIGHT VELOCITY ENVELOPE

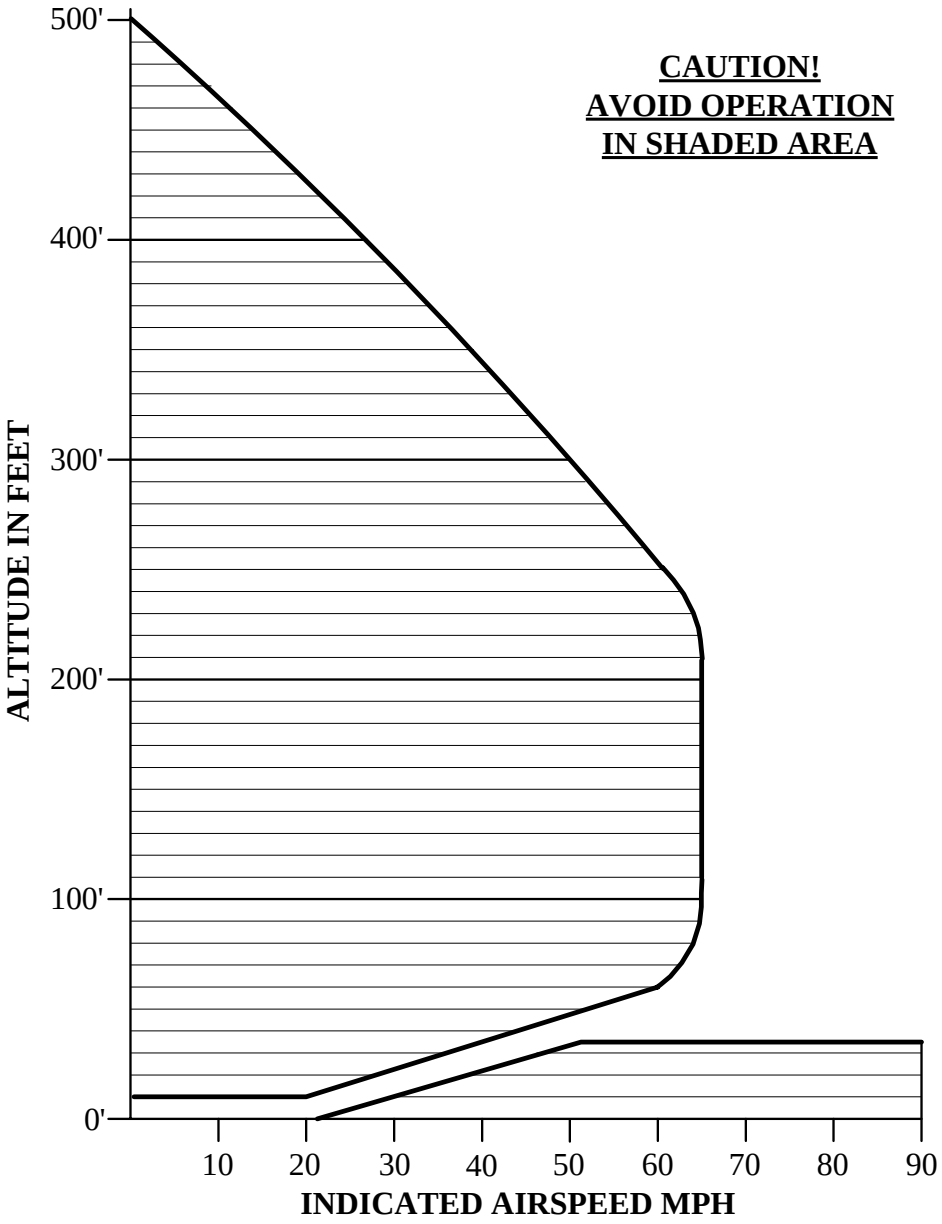
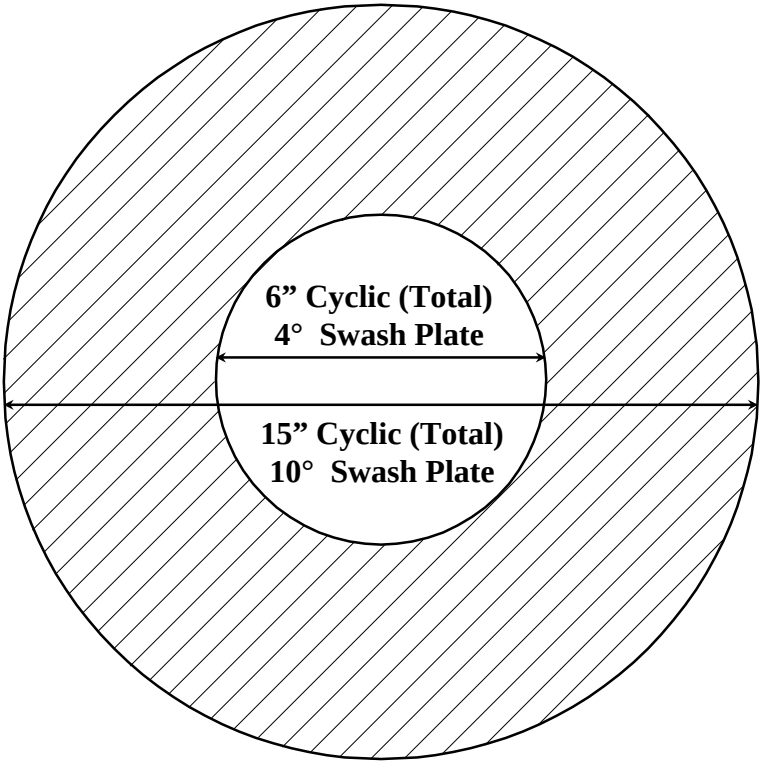


DIAGRAM FOR THE CYCLIC CONTROL AREA OF OPERATION



1. Cyclic handle position is affected by weight and balance.

2. The helicopter must be rigged in compliance with the rigging instructions provided.

3. The cyclic handle should remain in the center during normal operations.

4. The shaded circle is for limited time use only.

Section 6. Weight and Balance

The center of gravity (C.G.) requirement for any helicopter is very important to its safe operation. In order to determine that your RotorWay "EXEC 90" has been built correctly and is weight and balanced properly, you will have to perform a static hang test.

Prior to performing the hang tests, the following operating conditions and limitations should be reviewed:

1. The empty weight of the EXEC 90 is 925 lbs.

2. The maximum take off weight is 1500 lbs.

3. The maximum variable load, consisting of pilot, passenger, fuel, and any ballast is 525 lbs.

4. Maximum pilot weight is 210 lbs.

5. Maximum passenger weight is 210 lbs.

6. Maximum pilot and passenger weight is 400 lbs.

7. SOLO flight is performed ONLY FROM THE LEFT SEAT and must have the ballast weight placed on the front passenger skid. The cyclic handle should fall within the 6 inch diameter control area of operation in a hover (see diagram on page 19).

8. DUAL flight requires the ballast weight be placed on the rear mount tube under the tail boom. Again the cyclic handle should fall within the 6 inch diameter control area of operation in a hover (see diagram on page 19).

To perform this test it will require a facility that will allow the aircraft to be suspended approximately 6 inches from the ground, hanging from the knuckle of the main rotor shaft (see sketch below). For this test to be accurate the aircraft must be complete with the following:

1. Full coolant and oil in aircraft

2. No fuel in tanks

3. Enclosed area, no wind

There will be three test configurations of the aircraft, each with a different cabin loading. If the helicopter falls within 1/2 degree (plus or minus) both laterally and fore/aft of the specified angles of the three tests, and if the helicopter has been properly rigged, the aircraft should be ready for the first run-ups and liftoffs.

Using the Weight and Balance Diagram on page 23, the following results should be obtained within 1/2 degree (plus or minus) in all three tests. NOTE: During all tests the main rotor blades must remain in the fore and aft position (parallel to the tail boom).

NOTE: Hook should be centered over shaft to distribute weight evenly.

A. EMPTY AIRCRAFT (no cabin weight, ballast weight in solo front skid location)

Fore and Aft..... 3 degrees aft
Lateral..... 2 degrees pass. side

B. PILOT ONLY 150 lbs. (ballast weight in solo front skid location)

Fore and Aft..... 1 degree fore
Lateral..... 0 degrees

C. PILOT 210 lbs. and PASSENGER 210 lbs. (ballast weight in rear dual location)

Fore and Aft..... 5 degrees fore
Lateral..... 1/2 degree pass. side

The results of these tests should be recorded in the appropriate columns on the diagram provided on page 23.

IMPORTANT: If you are unable to achieve within 1/2 degree the results specified above, contact RotorWay Customer Service Department for assistance before attempting to lift off the aircraft. The weight and balance of any helicopter is critical and this helicopter should not be flown until the pilot is aware of the weight and balance schedule and the hang test has been satisfactorily performed.

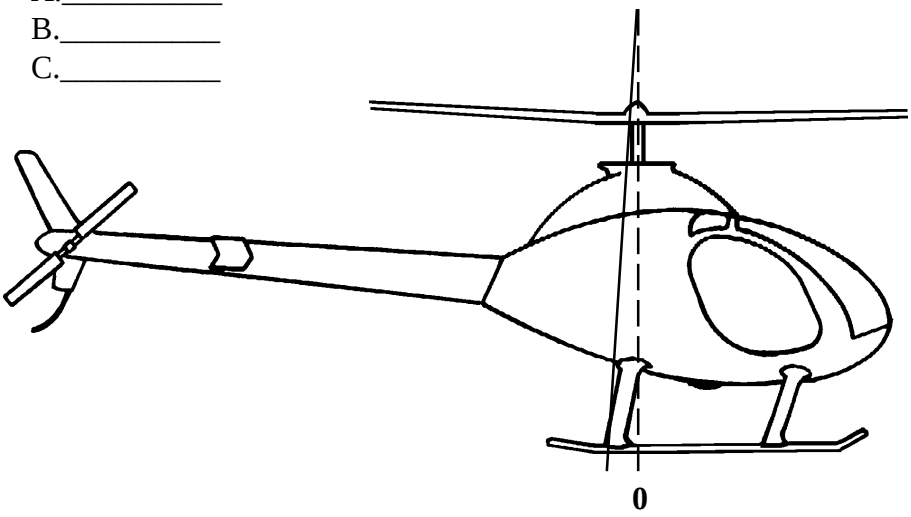
WEIGHT AND BALANCE DIAGRAM

Fore and Aft Measurements:

A._____

B._____

C._____

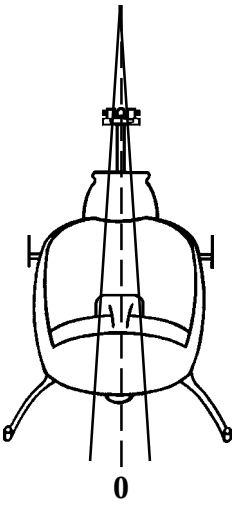


Lateral Measurements:

A._____

B._____

C._____



SAMPLE WEIGHT AND BALANCE
AIRCRAFT ON SCALES

Weight x Arm Inch = Moment Inch

Total Moment Inch ÷ Total Weight = Balance Location

FORE / AFT

	WT. LBS.	ARM INCH	MOMENT INCH LBS.
Front Scale	71	55.75	3958.25
Rear Scale	853	109.25	93190.25
	924		97148.50
		105.13	

LATERAL

	WT. LBS.	ARM INCH	MOMENT INCH LBS.
Passenger Skid	474	31.5+	14931.0
Pilot Skid	450	31.25-	14062.5-
	924		868.5
		.94+	

FORE / AFT

	WT. LBS.	ARM INCH	MOMENT INCH LBS.
Basic Wt.	924	105.13	97148.50
Ballast Wt. Forward	27	37.25	1005.75
Pilot	210	71.0	14910.0
Fuel	60	100.0	6000.0
	1221		119064.25
		97.51 CG	

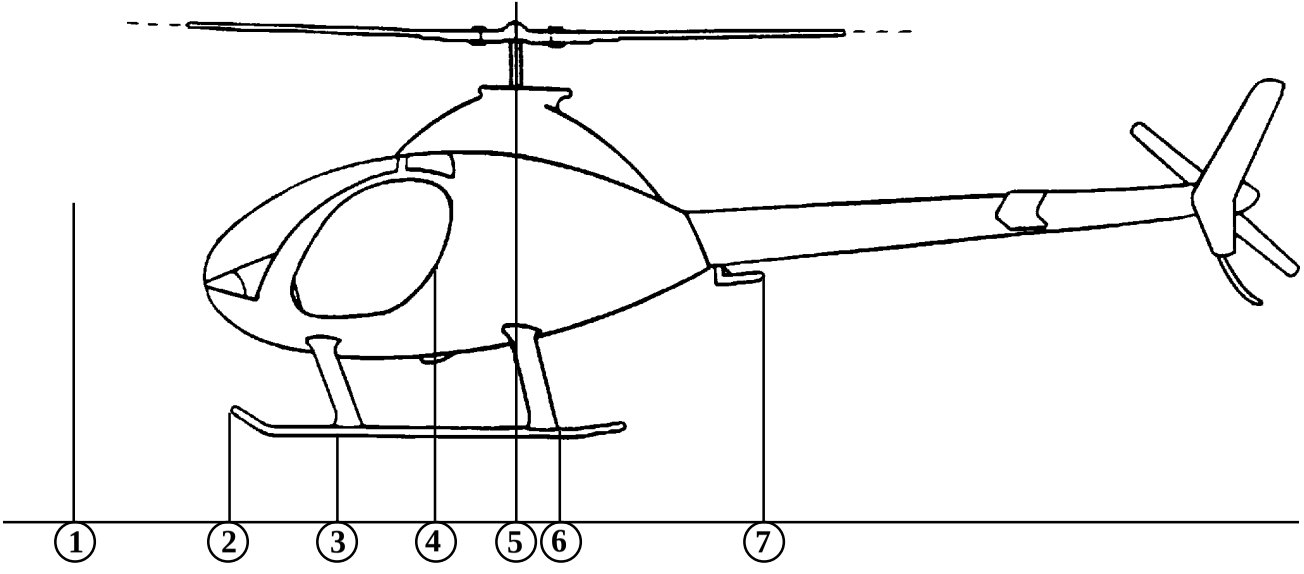
(See Chart on Page 26)

LATERAL

	WT. LBS.	ARM INCH	MOMENT INCH LBS.
Basic Wt.	924	.94+	868.5+
Ballast Wt. Pass. Skid	27	31.5 +	850.5+
Pilot	210	10.25-	2152.5-
Fuel Pilot	30	18.25-	547.5-
Fuel Pass.	30	18.5+	555.0+
	1221		426. -
		.34 - CG	

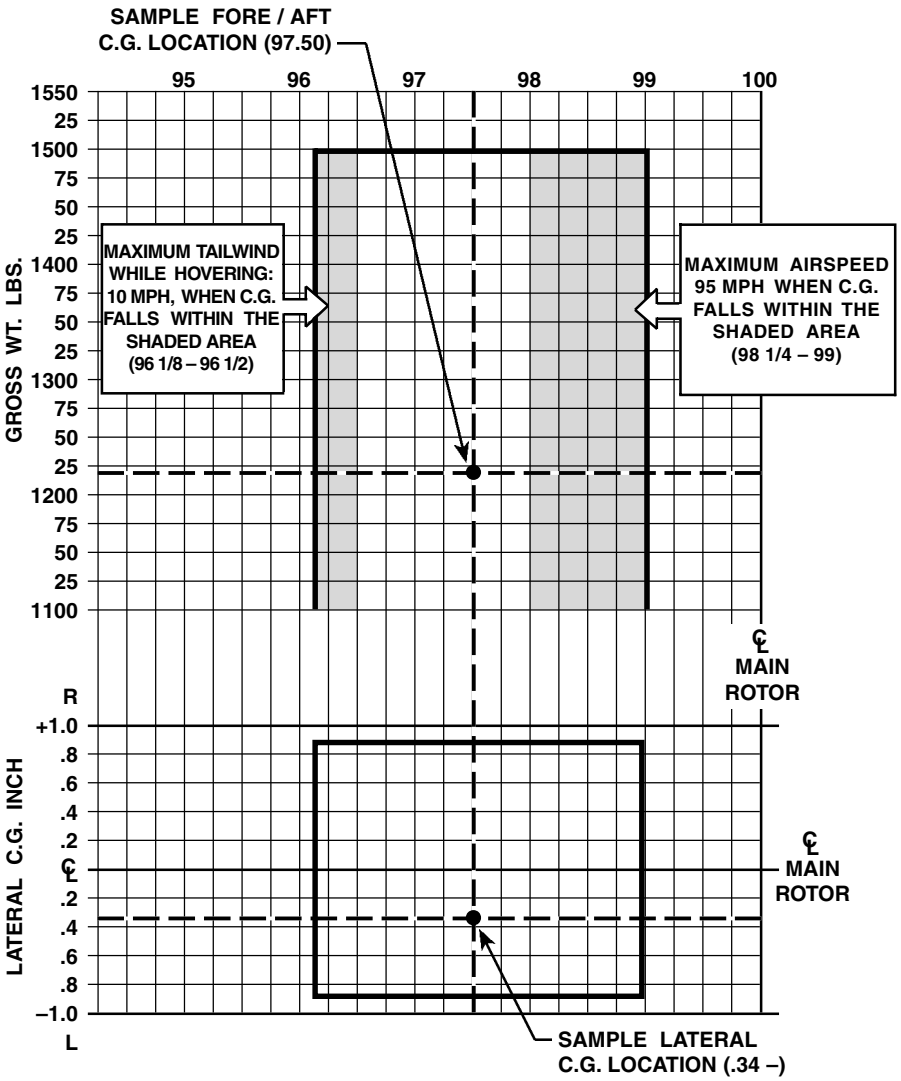
(See Chart on Page 26)

FORE/AFT ARM INCH		LATERAL ARM INCH	
1. DATUM	0	PASSENGER SKID	+31.5R
2. FORWARD WEIGHT POSITION	37.25	PASSENGER SEAT	+10.5R
3. FORWARD WEIGHING POINT	55.75	PASSENGER GAS TANK	+18.5R
4. SEATS	71.0	PILOT SKID	-31.25L
5. MAIN SHAFT AND GAS TANKS	100.0	PILOT SEAT	-10.25L
6. REAR WEIGHING POINT	109.25	PILOT GAS TANK	-18.25L
7. REAR WEIGHT POSITION	163.0		

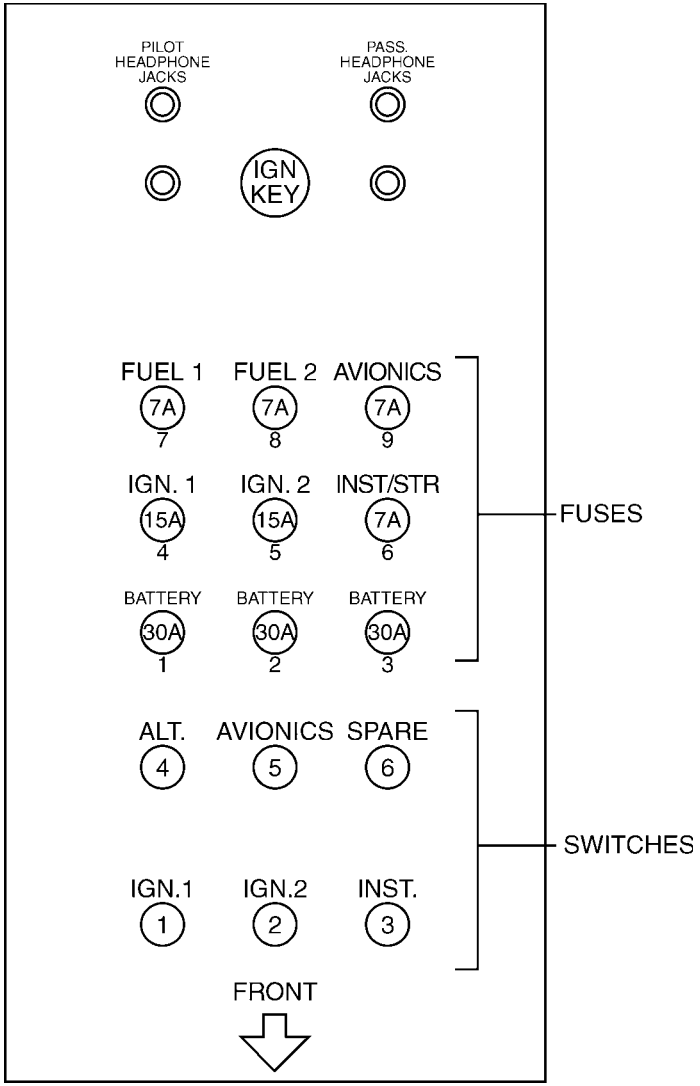


DATUM SCALE IS GRADUATED IN INCHES. THESE CALCULATIONS ARE DETERMINED WITH THE MAIN ROTOR SHAFT 90 DEGREES TO THE GROUND WHEN THE AIRCRAFT IS WEIGHED.

ROTORWAY EXEC 90
CENTER OF GRAVITY LIMITS



SWITCH PANEL DIAGRAM
(As viewed from below)



START UP, RUN UP & TAKE OFF

1. Preflight aircraft
2. Untie main and tail rotor blades
3. Oil chain and check master link
4. Check ballast weight location
5. Position blade perpendicular to ship
6. Fasten seat and shoulder harness and tuck in ends
7. Check controls
8. Clutch disengaged
9. Check fuel pumps and ignition lights
10. Key, instrument and ignition switches on
11. Turn gas valve on
12. Controls in start position
13. Clear area
14. Start engine - oil pressure within 5 seconds
15. Adjust idle with throttle until smooth (2000 RPM)
16. Engage clutch and turn on alternator
17. Check each ignition system
18. Idle until oil temp is on the gauge
19. Increase RPM to show a charge on voltmeter,
    then roll off throttle to check free wheel unit
20. Avionics and headset on
21. Stow checklist after reviewing #22-24 and #1-6 on landing list
22. Increase throttle to operating RPM
23. Establish ship light on the skids with
    instruments and controls within limits
24. Look outside, then slowly lift off

LANDING, COOL DOWN & SHUT OFF

1. Position aircraft into the wind, RPM in the green
2. Maintain 12” to 18” hover over level ground
3. Relax, look outside off into the distance
4. Slowly begin lowering collective
5. Upon ground impact, continue lowering until ship is firmly positioned
6. Roll off throttle, keeping hands on controls
7. Listen and feel ship for any noise or vibration
8. Note oil temp reading for cool down
9. Check ignition system
10. After 10 degree oil temp drop, turn gas valve off
11. After engine shut down, ignition, instrument, alternator,
    avionics and key off
12. Disengage clutch
13. Remain in ship until rotor blades stop completely
14. Check keeper on the master link
15. Check bearing temps
16. Secure main rotor and tail rotor blades
17. Check under ship for leaks