AIRPLANE FLIGHT MANUAL

MODEL PA-28-180

FAA IDENTIFICATION NO. N2189T

SERIAL NO. 28-7205041

(SERIAL NOS. 28-5601 THROUGH 28-7205091)

THIS DOCUMENT MUST BE KEPT IN AIRPLANE AT ALL TIMES.

FAA DOA SO-1
APPROVED H. M. Toomey
H. M. Toomey

DATE 4/22/69

WARNING

The rudder pedals are suspended from a torque tube which extends across the fuselage. The pilot should become familiar with the proper positioning of his feet on the rudder pedals so as to avoid interference with the torque tube when moving the rudder pedals or operating the toe brakes. 757 436

Log of Revisions

REVISION NO.	PAGE	DESCRIPTION	APPROVED	DATE
1	10	Revised weight and arm of individual rear seats from 28.0 and 118.1 to 27.0 and 124.1		
	13	Added -2 or -13 to Piper drawing 62143 (Tru Speed Indicator)		
	18	Revised weight and arm of adjustable front seats from 3.8 and 85.5 to 3.2 and 87.5	V. Jennard	12 JULY 1971
2	10	Added inertia safety belts		
		Added wheel fairings		
	11	Corrected name of battery		
	15	Added Genave 200A and 300 Radio		
		Added King KX170 Radio		
		Added King KI201 Omni Indicator		
	17	Added I.F.D. Starlight Transponder		
	18	Added King KN60C DME		
		Deleted Wheel Fairings		
		Added inertia safety belts (rear)		
		Deleted inertia safety belts (set of 2)		
	16,17,18,19	Retyped pages	V. Jennard	11 AUG. 1971

Log of Revisions

REV. NO.	PAGE	DESCRIPTION	APPROVED	DATE
1	1	Engine Limitations Section: Deleted "Maximum Permissible RPM for Take-off, 2475".		
	3	Added to Placard No. 3: "Baggage Maximum 200 Lbs."	H. M. Toomey FAA DOA SO-1	12/17/69
2	2	Added Forward Intermediate and Forward Gross Weight Points	H. M. Toomey FAA DOA SO-1	5/8/70
3	4	Placards Section: Added Items 8 and 9.		
	7	Procedures Section: Added Item 8. Added Page 7	G. C. Stephen FAA DOA DO-1	5/19/70

Piper Model PA-28-180
Normal and Utility Categories

AIRPLANE FLIGHT MANUAL

1. Limitations Section — The following limitations must be observed in the operation of this airplane:

Engine	Lycoming 0-360-A4A
Engine Limits	For all operations, 2700 rpm, 180 hp.
Fuel	91/96 minimum octane aviation fuel.
Propeller	Sensenich M76EMMS or 76EM8S5. Maximum diameter 76 inches, minimum diameter 76 inches. Static RPM at maximum permissible throttle setting. Not over 2450, not under 2275. No additional tolerance permitted.
Power Instruments	Oil Temperature: GREEN arc (normal operating range) 75°F to 245°F RED line (maximum) 245°F.
	Oil Pressure: GREEN arc (normal operating range) 60 psi to 90 psi YELLOW arc (caution range) 25 psi to 60 psi RED line (minimum) 60 psi RED line (maximum) 90 psi
	Fuel Pressure: GREEN arc (normal operating range) .5 psi to 8 psi RED line (minimum) .5 psi RED line (maximum) 8 psi
	Tachometer: GREEN arc (normal operating range) 500 to 2700 rpm RED line (maximum continuous power) 2700 rpm

Airspeed Limits

Never exceed	171 mph
Maximum structural cruise	140
Maneuvering	129
Flaps extended	115
Maximum positive load factor	3.8 Normal Category
Maximum positive load factor	4.4 Utility Category
Maximum negative load factor	No inverted maneuvers approved

Maximum Weight

2400 lbs - Normal Category; 1950 lbs - Utility Category.

Baggage Capacity

200 lbs.

C. G. Range

The datum used is 78.4 inches ahead of wing leading edge at the intersection of the straight and tapered section.

1. Normal Category (S/N 671 thru S/N 5859, inclusive)

Weight (Pounds)	Forward Limit (In. Aft of Datum)	Rearward Limit (In. Aft of Datum)
2400	92.1	94.5
2200	89.2	95.9
1975	85.9	95.9
1650	84.0	95.9

Normal Category (S/N 7105001 and up)

Weight (Pounds)	Forward Limit (In. Aft of Datum)	Rearward Limit (In. Aft of Datum)
2400	91.0	94.5
2200	87.8	95.9
2150	87.0	95.9
1650	84.0	95.9

2. Utility Category

Weight (Pounds)	Forward Limit (In. Aft of Datum)	Rearward Limit (In. Aft of Datum)
1950	85.8	86.5
1650	84.0	86.5

Straight Line variation between points given.

NOTE: It is the responsibility of the airplane owner and the pilot to insure that the airplane is properly loaded. See weight and balance section for proper loading instructions.

Maneuvers

1. Normal Category - All acrobatic maneuvers including spins prohibited.
2. Utility Category - Approved maneuvers for Utility Category only.

	Entry Speed
Spins (Flaps Up)	Stall
Steep Turns	129 mph
Lazy Eights	129
Chandelles	129

Placards

1. In full view of the pilot:

"THIS AIRPLANE MUST BE OPERATED AS A NORMAL OR UTILITY CATEGORY AIRPLANE IN COMPLIANCE WITH THE OPERATING LIMITATIONS STATED IN THE FORM OF PLACARDS, MARKINGS AND MANUALS.

ALL MARKINGS AND PLACARDS ON THIS AIRPLANE APPLY TO ITS OPERATION AS A UTILITY CATEGORY AIRPLANE. FOR NORMAL AND UTILITY CATEGORY OPERATIONS, REFER TO THE AIRPLANE FLIGHT MANUAL.

FOR SPIN RECOVERY, USE FULL RUDDER AGAINST SPIN, FOLLOWED IMMEDIATELY BY FORWARD WHEEL.

NO ACROBATIC MANEUVERS (INCLUDING SPINS) ARE APPROVED FOR NORMAL CATEGORY OPERATIONS."

2. Adjacent to upper door latch:

"ENGAGE LATCH BEFORE FLIGHT."

3. On the inside of the baggage compartment door:

"BAGGAGE MAXIMUM 200 LBS."

"UTILITY CATEGORY OPERATION - NO BAGGAGE OR AFT PASSENGERS ALLOWED. NORMAL CATEGORY OPERATION - SEE AIRPLANE FLIGHT MANUAL WEIGHT AND BALANCE SECTION FOR BAGGAGE AND AFT PASSENGER LIMITATIONS."

4. In full view of the pilot:

"ROUGH AIR OR MANEUVERING SPEED - 129 MPH."

"UTILITY CATEGORY OPERATION - NO AFT PASSENGERS ALLOWED."

5. On the instrument panel in full view of the pilot when the oil cooler winterization kit is installed:

"OIL COOLER WINTERIZATION PLATE TO BE REMOVED WHEN AMBIENT TEMPERATURE EXCEEDS 50°F."

6. On the instrument panel in full view of the pilot when the autoflite is installed:

"FOR HEADING CHANGES: PRESS DISENGAGE SWITCH ON CONTROL WHEEL. CHANGE HEADING, RELEASE DISENGAGE SWITCH."

Placards (Cont'd)

7. In full view of the pilot: "UTILITY CATEGORY ONLY."

Acrobatic maneuvers are limited to the following:

	Entry Speed
Spins (Flaps Up)	Stall
Steep Turns	129 mph
Lazy Eights	129
Chandelles	129

8. On the instrument panel in full view of the pilot when the AutoFlite II is installed:

"TURN AUTOFLITE ON. ADJUST TRIM KNOB FOR MINIMUM HEADING CHANGE. FOR HEADING CHANGE, PRESS DISENGAGE SWITCH ON CONTROL WHEEL, CHANGE HEADING, RELEASE SWITCH. ROTATE TURN KNOB FOR TURN COMMANDS. PUSH TURN KNOB IN TO ENGAGE TRACKER. PUSH TRIM KNOB IN FOR HI SENSITIVITY. LIMITATIONS AUTOFLITE OFF FOR TAKEOFF AND LANDING."

9. On the instrument panel in full view of the pilot when the supplementary white strobe lights are installed:

"WARNING - TURN OFF STROBE LIGHTS WHEN TAXIING IN VICINITY OF OTHER AIRCRAFT, OR DURING FLIGHT THROUGH CLOUD, FOG OR HAZE."

Airspeed Instrument Markings

RED radial line	Never Exceed	171 mph (148 knots)
YELLOW arc	Caution Range (Smooth Air Only)	140 to 171 mph (121 to 148 knots)
GREEN arc	Normal Operating Range	67 to 140 mph (58 to 121 knots)
WHITE arc	Flap Down Range	57 to 115 mph (50 to 100 knots)

2. Procedures Section

1. The stall-warning system is inoperative with the master switch off.

2. Electric fuel pump must be on for both landing and takeoff.

3. The PA-28-180 airplane is approved under FAA Regulation CAR 3 which prohibits intentional spins for normal category operation. The following information is noteworthy:

   a. The stall characteristics of the PA-28-180 are normal with the nose pitching down moderately following the stall, occasionally with a moderate roll which can be corrected by normal use of ailerons and rudder against the roll.

   b. Prolonged use of full rudder during stall practice may result in a rapid roll followed by a spin and should be avoided. Recovery from an incipient spin may be effected in less than one additional turn by use of opposite rudder followed by full forward control wheel.

   c. In the event that a fully developed spin is inadvertently experienced, recovery is best made by using full opposite rudder followed by full forward wheel and full opposite aileron. The control positions against the spin should be maintained during the entire recovery, which may require several turns and a substantial loss of altitude if the airplane is loaded heavily with a rearward center of gravity.

4. Except as noted above, all operating procedures for this airplane are normal.

2. Procedures Section (Cont'd)

5. (Electric Pitch Trim Installation Only with Pitch Trim Switch)

The following emergency information applies in case of electric pitch trim malfunction:

a. In case of malfunction, disengage electric pitch trim by pushing pitch trim switch on instrument panel to OFF position.

b. In an emergency, electric pitch trim may be overpowered using manual pitch trim.

c. In cruise configuration, malfunction results in 10^{o} pitch change and 30 ft altitude variation.

6. (Autoflite Installation Only)

The following emergency information applies in case of autoflite malfunction:

a. In case of malfunction PRESS disconnect switch on pilot's control wheel.

b. Rocker switch on instrument panel - OFF.

c. Unit may be overpowered manually.

d. In cruise configuration malfunction, 3 seconds delay results in 60^{o} bank, and 100 ft altitude loss.

e. In approach configuration malfunction, 1 second delay results in 10^{o} bank and 0 ft altitude loss.

7. (AutoControl III Installation Only)

I. Limitations: Pilot off during takeoff and landing.

II. Procedures:

a. Normal Operation

Refers to Manufacturer's Operation Manual.

b. Emergency

1. In case of malfunction, disengage manual controls.

2. In emergency, pilot may be overpowered manually.

3. In cruise configuration malfunction, 3 seconds delay results in 60^{o} bank and 100 ft altitude loss.

4. In approach configuration malfunction, 1 second delay results in 10^{o} bank and 0 ft altitude loss.

2. Procedures Section (Cont'd)

8. (AutoFlite II Installation Only)

I Limitations: AutoFlite off for takeoff and landing.

II Procedures:

a. Normal Operation - Refer to Manufacturer's Operation Manual.

b. Emergency

1. In case of malfunction PRESS disconnect switch on pilot's control wheel.
2. Rocker switch on instrument panel - OFF.
3. Unit may be overpowered manually.
4. In cruise configuration malfunction, 3 seconds delay results in 60^{o} bank, and 100' altitude loss.
5. In approach configuration malfunction, 1 second delay results in 10^{o} bank and 0' altitude loss.

3. Performance Section

The following performance figures were obtained during FAA type tests and may be realized under conditions indicated with the airplane and engine in good condition and with average piloting technique. All performance is given for 2400 pounds.

Loss of altitude during stalls varied from 125 to 200 feet, depending on configuration and power.

Stalling speeds, in mph, power off, versus angle of bank (Calibrated Airspeed):

Angle of bank	0	20	40	50	60
Flaps Up	67	69	76	83	94
Flaps Down	57	--	--	--	--

FAA APPROVED 4/22/69

REVISED 8/10/70 Rev. No. 3

REPORT VB-268

WEIGHT & BALANCE DATA

AND

EQUIPMENT LIST

MODEL PA-28-180

DATE August 17, 1970

Weight and Balance / Equipment List Revision

Aircraft #: N2189T
Make: Piper
Model: PA-28-180
Serial #: 28-7205041

Date: 2/24/2015
Name: Mike Hinds
A&P #: 3372164

Previous:	Date: 11/18/2014	Weight (Pounds): 1411.32	Arm (Inch): 87.4335	Moment (Inch/Pounds): 123396.65

Equipment List	In	Out	Weight	Arm	Moment
Turn Bank P/N 52D75-4		X	-2.5	64.4	-161
Horizon Gyro P/N 23-501-017		X	-1.8	64.4	-115.92
Turn Coordinator P/N 1394T100-7Z	X		1.2	64.4	77.28
Horizon Gyro P/N 102-0041-04	X		2.25	64.4	144.9
TOTALS			-0.85		-54.74

New Aircraft Empty Weight: 1410.47
New Arm: 87.4474
New Moment: 123341.91
Max Gross Weight: 2400
New Useful Load: 989.53

Signature: Mike Hinds A&P 3372164

NOTE: Weight and Balance must be completed and attached to pilot's operating handbook.

Weight and Balance / Equipment List Revision

Aircraft #: N 2189T
Make: Piper
Model: PA-28-180
Serial #: 28-7205041

Date: 11-18-14
Name: Mike Hays
A&P #: 3372164

Previous:	Date: 6/11/14		Weight (Pounds): 1415.02	Arm (Inch): 86.73	Moment (Inch/Pounds): 122726.3
Equipment List	In	Out	Weight	Arm	Moment
Starter Lycoming M2 4206		X	-18	19.5	-351
Battery Gill 35 S/N G02320028		X	-27	168.0	-4536
Starter Sky-Tec P/N 149-NL S/N FN3814261	X		9.3	19.5	181.38
Battery Concorde Model RG-35AXC S/N 40684537	X		32	168.0	5376
TOTALS			1411.32		123396.65

Superceded 2-24-15

New Aircraft Empty Weight: 1411.32
New Arm: 87.4335
New Moment: 123396.65
Max Gross Weight: 2400
New Useful Load: 988.68

Signature: Mike Hays

Authorization: A&P# 3372164

NOTE: Weight and Balance must be completed and attached to pilot's operating handbook.

Weight & Balance Change

K.R.T. Aviation LLC.	**Make**	Piper
8888 Jack Bates Ave	**Model**	PA-28-180
Tulsa, OK 74132	**S/N**	28-7205041
918-710-0073	**Reg. #**	N2189T
	W/O	1048/ invoice 355

EQUIPMENT CHANGE - WEIGHT & BALANCE

Items: (Description / P/N / S/N)	Weight Pounds	Arm Inches	Moments Inch/Pounds
Previous Aircraft Empty Weight:	1419.45	86.68	123037.02
Removed Bendix/King KA134 AUDIO PANEL	-0.8	61	-48.8
Removed Bendix/King KX-155 NAV/COMM	-5.48	61	-334.28
Removed Bendix/King KI-208 INDICATOR	-1	64	-64
Removed Bendix/King KR86 ADF	-3.1	61	-189.1
Removed Bendix/King KA42 ANTENNA	-1.25	64	-80
Removed Bendix/King KR22 MKR BCN RX	-0.4	156	-62.4
Removed Apollo Fly Buddy Plus 800 LORAN	-2.6	61	-158.6
Removed Apollo Fly Buddy Plus 800 ANTENNA	-0.3	116	-34.8
Installed Garmin GMA340 AUDIO PANEL	1.7	61	103.7
Installed Garmin GTN650 GPS/NAV/COMM	7	61	427
Installed Garmin GI-106A Indicator	1.4	64	89.6
Installed Garmin GA35 WAAS ANTENNA	0.5	94	47
Installed ACK A-30.9 ENCODER	0.4	60	24
Removed Terra AT3000 Encoder	-0.5	60	-30
			0
Totals	1415.02		122726.34

A. Old Empty Weight	1419.45	Pounds
B. Old Empty CG	86.68	Inches
C. Old Empty Weight CG Moment	123037	Inch/Pounds
D. Max Gross Weight	2400	Pounds
E. Old Useful Load	980.55	Pounds

Superceded 11-18-14

A. New Empty Weight	1415.02	Pounds
B. New Empty CG	86.73117	Inches
C. New Empty Weight CG Moment	122726.3	Inch/Pounds
D. Max Gross Weight	2400	Pounds
E. New Useful Load	984.98	Pounds

This new weight & balance information superseads all previous weight and balance data.
For aircraft loading, see instructions in Weight & Balance Section of Aircraft Flight Manual.

FAA Form 337 Completed?	YES
Equipment List Amended?	YES

Authorized Signature	**Date**	**Cert#**	**Title**
Keith Thomas	**6/11/2014**	3370165	Airframe and powerplant

Notes:

Weight and Balance Report

Aircraft: **Make** Piper **Model** PA-28-180 **S/N** 28-7205041
N# 2189T

Date: 10/02/2004

Description		Weight	Arm	Moment
Weight and Balance dated 10/02/1996		1422.95	86.62	123255.92
Removed:	Kx-170B	-7.0	61.0	-427.0
	KI-214	-3.0	64.0	-192.0
Installed:	Kx-155	5.3	61.0	323.3
	KI-209	1.2	64.0	76.8
Totals:	***New Empty Weight***	1419.45	***CG*** 86.68	***Moment*** 123037.02

Signed: Peter Sorensen AP 2812610

Superseeded
06/11/14

Weight and Balance Report

N#: 2189T Model: PA28-160 Make: Piper

S/N: 287205041 Date: 10/02/96 W.O. #:

ITEM	WEIGHT	ARM	MOMENT
Aircraft Empty Weight	1422.95	86.62	123255.92
Flap Hinge Farings	1.4	133.	186.2
Wing Root Farings	1.8	64.65	116.37
NEW FIGURES	1426.15	86.38	123558.49

Superceded 10/02/2004

New Empty Weight: 1426.15

Useful Load:

Max Ramp Weight:

New CG Arm: 86.38

New Moment: 123558.49

Signed: [signature] A&P 446789398 IA

Weight and Balance Report

N#: N2189T Model: PA-28-181 Make: Piper

S/N: 28-7205041 Date: 3-7-95 W.O. #:

ITEM	WEIGHT	ARM	MOMENT
Aircraft Empty Weight	1419.2	86.44	122679.98
Aileron & Flap Gap Seals	+3.0	129.	+387.00
Stabilator Seals	+0.5	308.	+154.00
Flap/Fuselage Gap Seals	+0.25	136.	+ 34.00
NEW FIGURES	1422.95	86.62	123254.98

Superceded
10-2-96

New Empty Weight: 1422.95 New CG Arm: 86.62

Useful Load: New Moment: 123254.98

Max Ramp Weight: Signed: [signature]
A&P 446789398 IA

Weight and Balance Report

N#. N2189T Model: PA-28-181 Make: PIPER

S/N: 28-7205041 Date: 11-11-93 W.O. #:

ITEM	WEIGHT	ARM	MOMENT
Aircraft Empty Weight	+1420.3	86.56	122832.14
Old ELT	- 3.0		- 414.99
New ELT	+ 1.9		262.83
New Antenna	Negligible		
NEW FIGURES	1419.2	86.44	122679.98

SUPERCEDED 3/7/95

New Empty Weight: 1419.2 New CG Arm: 86.44

Useful Load: New Moment: 122679.98

Max Ramp Weight: Signed: [signature] 4467898

BUTLER AVIATION

BUTLER AVIATION-TULSA, INC., SUBSIDIARY OF BUTLER AVIATION INTERNATIONAL, INC.
7500 East Apache Road, Hangar 18, Tulsa International Airport, P.O. Box 582050, Tulsa, Oklahoma 74158 ☐ Telephone: (918) 836-3731

FAA REPAIR STATION HMCR730E

WEIGHT AND BALANCE REPORT

AIRCRAFT: MAKE Piper **MODEL** PA-28-180 **S/N** 28-7205041

A/C N# 2189T **DATE** 5-15-92 **WORK ORDER #** 49691

DESCRIPTION	S/N	WEIGHT	ARM	MOMENT
Weight and balance dated 3/2/89		1420.3	86.5	122918.04
Removed: STS 110 Loran	70400451	-4.0	61.0	-244.0
CI 122 SP-6		-.5	127.0	-63.5
Installed: II Morrow Model 800 Loran	79022	2.8	61.0	170.8
A23		.4	127.0	50.8
TOTAL		1419.0	86.56	122832.14

Superceded 11-11-93

NEW EMPTY WEIGHT 1419.0 **NEW CG ARM** 86.56
NEW USEFUL LOAD **NEW MOMENT** 122832.14
MAX. RAMP WEIGHT

SIGNED: Randall E Chester

GEORGE J. PRIESTER AVIATION SERVICES

1. .OR ALTERATION

MODEL: PA28-180 SERIAL NO.: 28-7205041 AIRCRAFT REGISTRATION: N2189T

Last Recorded Weight/Balance: DATE: October 20, 1988 Page 1 of 1

	WEIGHT	ARM	MOMENT
(Old Empty Weight):	1413.7	86.66	122,512.14
INSTALLED:			
Bendix/King KA-134	.8	61	48.8
Bendix/King KX-155	4.7	61	286.7
Bendix/King KI-208	1.1	64	70.4

Supplemental 5-15-92

(New Empty Weight): 1420.3 (New Moment): 122,918.04

New Empty Weight C.G.: 86.5 New Useful Load: 979.7

The above equipment installed per manufacturer installation manuals and AC.43.13.
The new center of gravity falls within the limits, as specified in the flight manual.
The new electrical load does not exceed 80 percent of the aircraft capability.

The aircraft, airframe, aircraft engine, propeller, appliance or component identified above was repaired and isnpected in accordance with current manufacturer instructions and in accordance with Aviation Regulations Part 43, and is approved for return to service as per these requirements. With respect to work performed, pertinent information of repairs are on file at this repair station under Work Order No.: R4705

DATE: March 20, 1989 SIGNED: Jack R. Skogh

[X] PAL-WAUKEE AIRPORT
FAA Repair Station No. 4303
Wheeling, Illinois 60090

[ ] P.O. BOX 294
AURORA MUNICIPAL AIRPORT
FAA Repair Station No. 4303A
Sugar Grove, Illinois 60554

N2189T
PA28-180
28-7205041

10-20-88

	Old Empty Weight	Old Moment	Old E.W.C.G.
	1408.7	122,239.14	86.8
Installed pilot toe brake installation	+5.0 at. 54.6	273.00	
	1413.7	122,512.14	

New Empty Weight	1413.7 lbs.
New E.W.C.G.	86.66
New Useful Load	986.3 lbs.

SUPERSEDED DATE 3-20-89

GEORGE J. PRIESTER AVIATION SERVICE INC.

Showalter

ROBERT H. SHOWALTER
PRESIDENT

RALPH E. LOOS
VICE PRESIDENT

FAA Certified Repair Station #4444
WEIGHT AND BALANCE CORRECTION SHEET

N N2189T

Date March 30, 1988

Serial # 28-7205041

Model PA28-180

Make Piper-Cherokee

Tach 4361.4 Hrs.

Superceded 10-20-88

	OLD EMPTY WEIGHT	OLD (E.W.C.G.)	OLD MOMENT
	1409.5	86.76	122289.74
REMOVED:			
1-Kx170B	7.0	61.0	427.0
1-KI208	1.0	64.0	64.0
1-D120P2T	1.2	60.0	72.0
	1400.3	86.93	121726.74
INSTALLED:			
1-STS110LORAN	4.0	61.0	244.0
1-Softpom Intercom	.5	61.0	30.5
1-KR86 ADF	3.9	61.0	237.9
	1408.7	86.8	122,239.14

New Empty Weight 1408.7

New E.W.C.G. 86.8

New Use Load 991.3

Signed [signature]

C.R.S. #4444

DATE	Florida Avionics, Inc.	W/O#
3/19/85	237 North Crystal Lake Drive Orlando, Florida 32803 FAA Repair Station #764-117	886

1. Aircraft Make	Model—	Serial #	N #
PIPER	PA28-180	28-7205041	1289T

2. Owner's Name	Address:
WIMBERLY M. WALTER, JR.	6766 NIGHTWIND CIRCLE ORLANDO, FL. 32818

	Weight	Arm	Moment
AIRCRAFT EMPTY WEIGHT	1408.3		122289.74
INSTALLED:			
TRANSCAL D120-P2T	1.2	60.0	72.0

Superseded 3/30/88

Moment / Weight		New Empty Weight CG		New Useful Load	
Moment	1222.89.74		86.76		990.5
Weight	1409.5				

MAYDAY AVIONICS CO
109 Sinclair Drive
Muskegon County Airport
Muskegon, Michigan 49441
FAA 308-12

Date November 26, 19 80

WEIGHT AND BALANCE DATA

AIRCRAFT OWNER

Crosswind Aviation
13542 Gratiot Ave.
Detroit, Mich. 48205

AIRCRAFT

MAKE Piper - Cherokee
MODEL PA-28-180
SERIAL NO. 28-7205041
REGISTRATION N-2189T

COMPUTATION

	WEIGHT	ARM	MOMENT
Original	1420.2	87.00	123558.19
REMOVED:			
Narco MK24	-8.6	61.9	-532.34
Narco VOA40	-1.9	64.9	-123.31
Narco MK12A	-7.6	61.0	-463.60
Narco VOA5	-1.8	64.0	-115.20
Narco MP12	-4.8	58.0	-278.40
Narco UGR2	-5.0	168.0	-840
INSTALLED:			
King KX170B	7.0	61.0	427
King KX170B	7.0	61.0	427
King KI209	1.2	64.0	76.80
King KI208	1.0	64.0	64
King KN75	1.6	56.0	89.60
	1408.30	86.84	122289.74

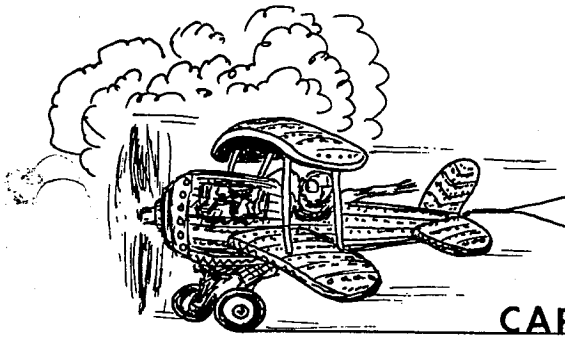
2/14-85

New Moment 122289.74
New C of G 86.84
New Empty Weight 1408.30
New Useful Load 991.70

A logbook entry has been made this date.

Authorized Signature L. R. Malone

Repairmans No. 2161651



CAM AIR INC.

CAPITOL AIRCRAFT MAINTENANCE

WEIGHT & BALANCE

6-6-79

INSTALLED STROBE LIGHT SYSTEM ONE EACH AT

STA. 110.00

A/C EMPTY WEIGHT	1417.7	86.96	123,283.19
STROBE	2.5	110.00	275.00
	1420.2		123,558.19

NEW EMPTY WEIGHT	1420.2 LBS
NEW CG	87.00
NEW MOMOMENT	123,558.19
NEW USEFUL LOAD	
NORMAL	979.80
UTILITY	529.80

A/C PA28-180 28-7205041 N 2184T

Don R. Clapchan

A&P/IA 2147390

CAPITAL CITY AIRPORT - LANSING, MICHIGAN, 48906 phone 517-321-1134

• Ron Brokob • • Don "CHIP"chase • • Larry Ingalls •

MICHIGAN AVIATION CO.
Municipal Airport
Pontiac, Mich.

F.A.A. Approved
Repair Station
No. 3042

EQUIPMENT INSTALLATION

AIRCRAFT	Make PIPER	Model PA-28-180	Serial No. 7205041	Registration No. 2189T
OWNER	Name LEE CEE AIRCRAFT INC.		Address 956 WESTLAND MICH	

Category	Empty Weight Pounds	Empty Weight C.G.	Useful Load
NORMAL	1917.7	86.96	

Installation Date	M.A.C. Work Order No.
3/25/79	7588

LIST OF EQUIPMENT INSTALLED OR REMOVED:

Item No.	Rem.	Inst.	Item Description	Current Draw
1		X	NARCO MK12A NAV. COMM.	
2		X	NARCO POWER SUPPLY	
3		X	NARCO OMNI CONVERTOR VOA-5	
4		X	NARCO VGR-2A GLIDE SLOPE	
5				
6				
7				
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28				

Page __ of __

Form AM-6

EQUIPMENT WEIGHT AND LOCATION:

Item No.	Weight	Arm	Location Description
1	7.6	41.00	RADIO PANEL
2	4.8	58.00	FIRE WALL
3	1.8	69.00	INSURMENT PANEL
4	5.0	168.0	AFT of BAGGAGE COMPARTMENT
5			
6			
7			
8			
9			
10			
11			
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28			

Original copy of this FORM will be made available to the aircraft owner for retention as part of the aircraft records, attach to EQUIPMENT LIST.

Remarks: WEIGHT & BAL DATA TAKEN FROM MINOR ALT FORM DATED 3-8-74.

STAMP

MAINTENANCE RELEASE:

The Aircraft and/or Component identified on reverse side ... has been ... in accordance with current ... regulations and was found Airworthy for ...

... records are on file at this Agency ... No. 7588

Date 3/25/74

Signed _____
(Signature of Authorized Individual)

MICHIGAN AVIATION CO. — Certificate No. 3042
PONTIAC MUNICIPAL AIRPORT, PONTIAC, MICHIGAN

REVISION OF WEIGHT AND BALANCE DATA AND EQUIPMENT LIST AND

LOADING SCHEDULE.

FOLLOWING EQUIPMENT REMOVED OR INSTALLED UNDER THE PROVISIONS

of

AC 43.13-1 as a MINOR ALTERATION

AIRPLANE Piper PA 28-180 SERIAL No 7205041 N 2189 DATE 3-8-74

INSTALLED or REMOVED	ITEM	WEIGHT	ARM	MOMENT
	Previous Aircraft Data	1402.8	86.86	121854.2
Installed	Piper Alternate Static Kit	+ .4	+ 66.0	+ 26.0
Installed	Piper Heated Pitot Kit	+ .4	+ 100.0	+ 40.0
Installed on 5-12-73	KS Aviontics EGT-ILN EX Gas Temp. System	+ .4	+ 67.4	+ 27.0
Removed	Bretha 200 NAV/COM	- 3.5	+ 64.0	- 224.0
Removed	OLC - 30 Head	- 2.0	+ 64.0	- 128.0
	Presemt Aircraft Data	1398.5	86.80	121595.2

SUPERSEDED 3/25/74 R.W.G.

CURRENT EMPTY WEIGHT 1398.5

CURRENT EMPTY WEIGHT C.G. 86.80

CURRENT USEFUL LOAD 1001.5 Normal Category

551.5 Utility Category

SIGNATURE: John R. Kinzer

RATING & NUMBER A&P 1372797

A.P. 1372797

NIEDERHAUSER AIRWAYS, Inc.

REVISION OF WEIGHT AND BALANCE DATA AND EQUIPMENT LIST AND LOADING SCHEDULE

FOLLOWING EQUIPMENT REMOVED OR INSTALLED UNDER THE PROVISIONS
of
AC 43.13-1 as a MINOR ALTERATION

AIRPLANE Pa 28 180 SERIAL NO. 28-7205041 N 2189T DATE 12-18-72

Installed or Removed	Item	Weight	Arm	Moment
	Previous Aircraft	1396.8	86.8	121288.5
Removed	PEM-ALL Fire Extinguisher	-5.0	75.0	-375.0
Removed	NASA VG Recorder	-1.5	107.0	-106.5
Installed	KT-76 King Transponder	3.0	64.0	192.0
	Present Aircraft	1393.3	86.84	120999.0
	Superseded. 3-31-73 LOGBOOK ENTRY.			
INSTALLED	Dittz 200	3.5	64	224
INSTALLED	OLC - 31	2.0	64	128
INSTALLED	FAIRMARK 288.	1.0	64	64
	SUPERCEDED 1-2-74 SEE LOG BOOK ENTRY	6.5		121415
INSTALLED	MARTECH EB-2BCD EAGLE EMERG LOCATOR TRANS	3.0	146.4	439.2
	NEW AIRCRAFT DATA	1396.3	86.86	121854.2

Continuous Duty Electrical Load ~~is~~ ~~Amps~~: Generator Capacity ~~is~~ doesn't exceed the ~~xx~~ of 60 Amps:
It is the Operators Responsibility to Determine That The Aircraft Remains Within Safe Electrical and Weight and Balance Limits. Refer to Weight and Balance Data Sheet and Loading Schedule and Center of Gravity Chart for Proper Loading.

J.M. Ruegger A&P 1372797

CURRENT EMPTY WEIGHT ~~1393.3~~ ~~1399.8~~ 1402.8

CURRENT EMPTY WEIGHT C.G. ~~86.84~~ ~~86.78~~ 86.86

CURRENT USEFUL LOAD ~~1006.7~~ ~~1000.2~~ 997.2

SUPERCEDED 3-8-74 J.M. Ruegger A&P 1372797

SIGNATURE Richard W. Earley

RATING & NUMBER Chief Inspector

NIEDERHAUSER AIRWAYS, Inc.

REVISION OF WEIGHT AND BALANCE DATA AND EQUIPMENT LIST AND LOADING SCHEDULE

FOLLOWING EQUIPMENT REMOVED OR INSTALLED UNDER THE PROVISIONS
of
AC 43.13–1 as a MINOR ALTERATION

AIRPLANE PIPER PA-28-180 SERIAL NO. 7205041 N2189T DATE 11-16-72

Installed or Removed	Item	Weight	Arm	Moment
	PREVIOUS AIRCRAFT	1407.6	86.9	122,187.5
REMOVED	NOSE GEAR FAIRING	3.8	34.8	132.0
REMOVED	MAIN GEAR FAIRING	7.0	109.6	767
	PRESENT AIRCRAFT	1396.8	86.8	121288.5

Superceded
12-18-72
M Turley

Continuous Duty Electrical Load is X Amps: Generator Capacity is X Amps:
It is the Operators Responsibility to Determine That The Aircraft Remains Within Safe Electrical and Weight and Balance Limits. Refer to Weight and Balance Data Sheet and Loading Schedule and Center of Gravity Chart for Proper Loading.

CURRENT EMPTY WEIGHT 1396.8

CURRENT EMPTY WEIGHT C.G. 86.8

CURRENT USEFUL LOAD 1003.2 NORMAL CATAGORY
553.2 UTILITY CATAGORY

NIEDERHAUSER AIRWAYS, INC.
WATERLOO, IOWA
F. A. A. APPROVED
REPAIR STATION NO. 304-5

SIGNATURE Richard C. Turley

RATING & NUMBER Chief Inspector

NIEDERHAUSER AIRWAYS, Inc.

REVISION OF WEIGHT AND BALANCE DATA AND EQUIPMENT LIST AND LOADING SCHEDULE

FOLLOWING EQUIPMENT REMOVED OR INSTALLED UNDER THE PROVISIONS
of
AC 43.13-1 as a MINOR ALTERATION

AIRPLANE Piper PA28-180 SERIAL NO. 7205041 N 2189T DATE 10-19-72

Installed or Removed	Item	Weight	Arm	Moment
Removed	Previous Aircraft	1,408.9	86.9	122,397.5
	Tow Bar	1.3	161.8	210.0
	Present Aircraft	1,407.6	86.9	122,187.5

SUPERCEDED 11-16-72

Continuous Duty Electrical Load is X Amps: Generator Capacity is X Amps:
It is the Operators Responsibility to Determine That The Aircraft Remains Within Safe Electrical and Weight and Balance Limits. Refer to Weight and Balance Data Sheet and Loading Schedule and Center of Gravity Chart for Proper Loading.

CURRENT EMPTY WEIGHT 1,407.6 lbs.

CURRENT EMPTY WEIGHT C.G. 86.1 in.

CURRENT USEFUL LOAD 992.4 lbs. Normal Catagory
542.4 lbs. Utility Catagory

SIGNATURE Lawrence P. Gruman

RATING & NUMBER Airframe Inspector

NIEDERHAUSER AIRWAYS, Inc.

REVISION OF WEIGHT AND BALANCE DATA AND EQUIPMENT LIST AND LOADING SCHEDULE

FOLLOWING EQUIPMENT REMOVED OR INSTALLED UNDER THE PROVISIONS
of
AC 43.13-1 as a MINOR ALTERATION

AIRPLANE Piper Pa 28-180 SERIAL NO. 7205041 N 2189T DATE 5-30-72

Installed or Removed	Item	Weight	Arm	Moment
Installed	Previos Aircraft	1,407.4	86.9	122,291.0
	NASA VG Recorder	1.5	107.0	106.5
	Present Aircraft	1,408.9	86.9	122,397.5

Superceeded
10-19-72

Continuous Duty Electrical Load is X Amps: Generator Capacity is X Amps:
It is the Operators Responsibility to Determine That The Aircraft Remains Within Safe Electrical and Weight and Balance Limits. Refer to Weight and Balance Data Sheet and Loading Schedule and Center of Gravity Chart for Proper Loading.

CURRENT EMPTY WEIGHT 1,408.9 lbs.

CURRENT EMPTY WEIGHT C.G. 86.9 In.

CURRENT USEFUL LOAD 991.1 lbs. Normal Catagory
541.1 lbs. Utility Catagory

SIGNATURE Lawrence P. Grueman

RATING & NUMBER Airframe Inspector

NIEDERHAUSER AIRWAYS, Inc.

REVISION OF WEIGHT AND BALANCE DATA AND EQUIPMENT LIST AND LOADING SCHEDULE

FOLLOWING EQUIPMENT REMOVED OR INSTALLED UNDER THE PROVISIONS
of
AC 43.13–1 as a MINOR ALTERATION

AIRPLANE PA28-180 SERIAL NO. 28-7205041 N- 2189T DATE 12-13-71

Installed or Removed	Item	Weight	Arm	Moment
	Previous Aircraft	1,402.4	86.9	121,916.0
Installed	PEM-ALL Model PA-27 Fire Extinguisher	5.0	75.0	375.0
	Present Aircraft	1,407.4	86.9	122,291.0

Superseded 5-30-72
Agusta P. Gruman

Continuous Duty Electrical Load is x Amps: Generator Capacity is x Amps:
It is the Operators Responsibility to Determine That The Aircraft Remains Within Safe Electrical and Weight and Balance Limits. Refer to Weight and Balance Data Sheet and Loading Schedule and Center of Gravity Chart for Proper Loading.

NIEDERHAUSER AIRWAYS, INC.
WATERLOO, IOWA
F. A. A. APPROVED
REPAIR STATION NO. 304-5

CURRENT EMPTY WEIGHT 1,407.4 lbs.

CURRENT EMPTY WEIGHT C.G. 86.9 Incs.

CURRENT USEFUL LOAD 992.6 Normal Catagory
542.6 Utility Catagory

SIGNATURE Richard W. Carley

RATING & NUMBER Chief Inspector

NIEDERHAUSER AIRWAYS, Inc.

REVISION OF WEIGHT AND BALANCE DATA AND EQUIPMENT LIST AND LOADING SCHEDULE

FOLLOWING EQUIPMENT REMOVED OR INSTALLED UNDER THE PROVISIONS
of
AC 43.13-1 as a MINOR ALTERATION

AIRPLANE PA28-180 SERIAL NO. 28-7205041 N 2189T DATE 9-21-71

Installed or Removed	Item	Weight	Arm	Moment
	Previous Aircraft	1,387.8	87.0	120,693
Installed	Narco Mark 24 (with rack)	8.6	61.9	532
Installed	VOA-40 Omni Convertor	1.9	64.9	123
Installed	Navigation Receiving Antenna	.5	265.0	133
Installed	Cable, Nav. Antenna	.9	157.0	141
Installed	AD-1 Comm. Antenna	.5	157.8	79
Installed	Cable, Comm. Antenna	.4	118.0	47
Installed	Telex 66T Microphone	.5	75.0	38
Installed	A6FC Speaker	1.3	100.0	130
	Present Aircraft	1,402.4	86.9	121916

Superseded 12-13-71 KMB

Continuous Duty Electrical Load is x Amps: Generator Capacity is x Amps:
It is the Operators Responsibility to Determine That The Aircraft Remains Within Safe Electrical and Weight and Balance Limits. Refer to Weight and Balance Data Sheet and Loading Schedule and Center of Gravity Chart for Proper Loading.

CURRENT EMPTY WEIGHT 1,402.4

CURRENT EMPTY WEIGHT C.G. 86.9

CURRENT USEFUL LOAD 997.6 Normal Catagory
547.6 Utility Catagory

SIGNATURE Ralph McCauley

RATING & NUMBER Chief Inspector

WEIGHT AND BALANCE DATA
MODEL PA-28-180 CHEROKEE

Airplane Serial Number 28 - 7205041

Registration Number N2189T

Date 9/14/71

AIRPLANE EMPTY WEIGHT

Item	Weight (lbs)	C.G. Arm (Inches Aft of Datum)	Moment (In-lbs)
Standard Empty Weight * ~~Actual~~ Computed	1350.0	86.7	117056
Optional Equipment	35.6	95.8	3410
Unusable Fuel (3 Pints)	2.2	103.0	227
Licensed Empty Weight = Total of Above Items	1387.8	87.0	120693

Superseded 9-21-71

* Standard Empty Weight includes paint, hydraulic fluid and undrainable engine oil.

AIRPLANE USEFUL LOAD

	(Gross Weight)	-	(Licensed Empty Weight)	= Useful Load
Normal Category:	(2400 lbs)	-	(1387.8 lbs)	= 1012.2 lbs.
Utility Category:	(1950 lbs)	-	(1387.8 lbs)	= 562.2 lbs.

THIS LICENSED EMPTY WEIGHT, C.G. AND USEFUL LOAD ARE FOR THE AIRPLANE AS DELIVERED FROM THE FACTORY. REFER TO APPROPRIATE AIRCRAFT RECORD WHEN ALTERATIONS HAVE BEEN MADE.

Mae Keeler

Inspection Representative

C.G. RANGE AND WEIGHT INSTRUCTIONS

1. Add the weight of all items to be loaded to the licensed empty weight.
2. Use the loading graph to determine the moment of all items to be carried in the airplane.
3. Add the moment of all items to be loaded to the licensed empty weight moment.
4. Divide the total moment by the total weight to determine the C.G. location.
5. By using the figures of Item 1 and Item 4, locate a point on the C.G. range and weight graph. If the point falls within the C.G. envelope, the loading meets the weight and balance requirements.

SAMPLE LOADING PROBLEM (Normal Category)

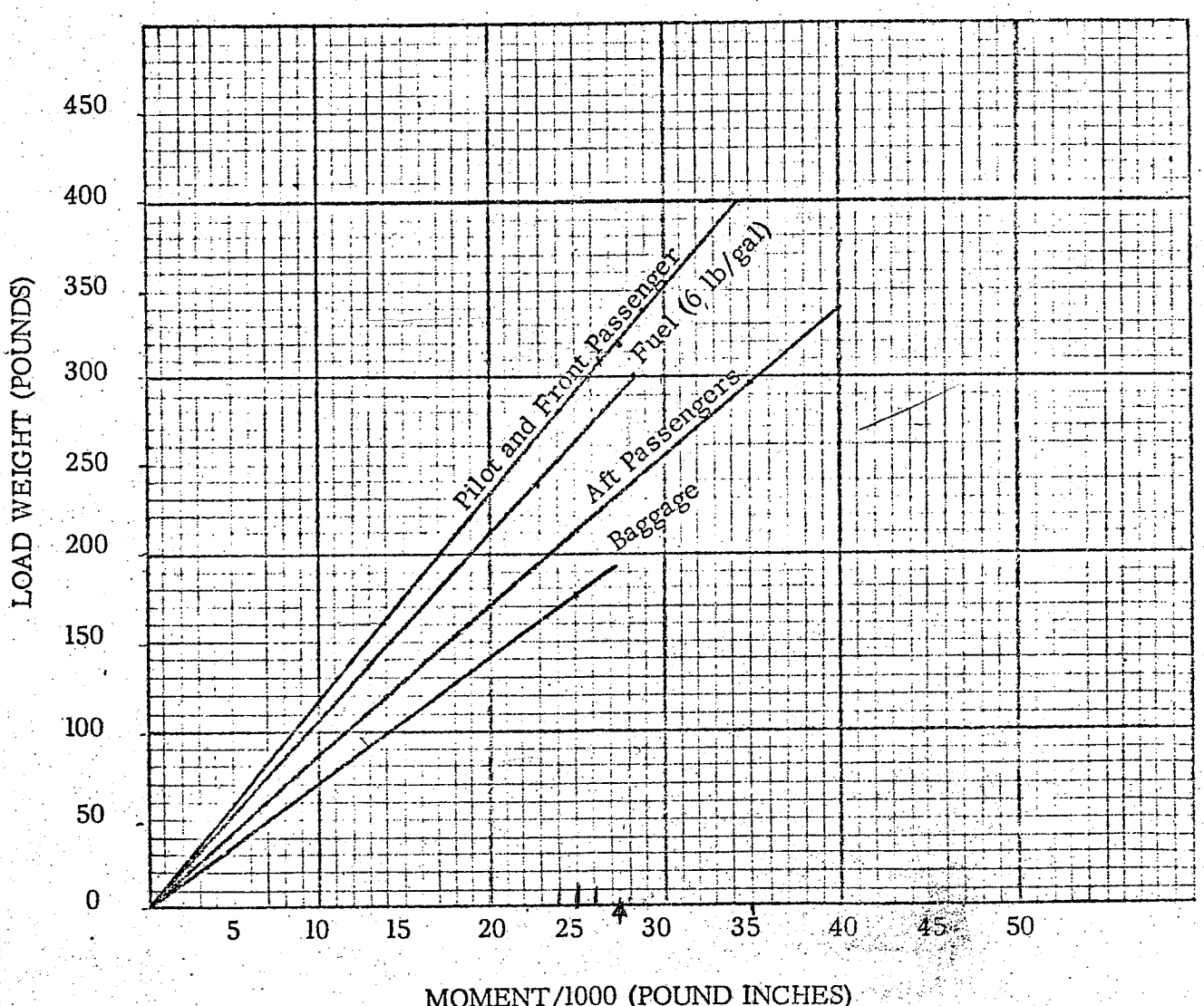
	Weight (lbs)	Arm Aft Datum (Inches)	Moment (In - Lbs)
Licensed Empty Weight	1387.8	87.0	120693
Oil (8 quarts)	15	32.5	488
Pilot and Front Passenger	340	85.5	29070
Passengers, Aft* (Rear Seat)	340	118.1	40154
Fuel (50 Gal. Maximum)	300	95.0	28500
Baggage *	17.2	142.8	2456
Total Loaded Airplane	2400	92.2	221361

The center of gravity (C.G.) of this sample loading problem is at 92.2 inches aft of the datum line. Locate this point (92.2) on the C.G. range and weight graph. Since this point falls within the weight - C.G. envelope, this loading meets the weight and balance requirements.

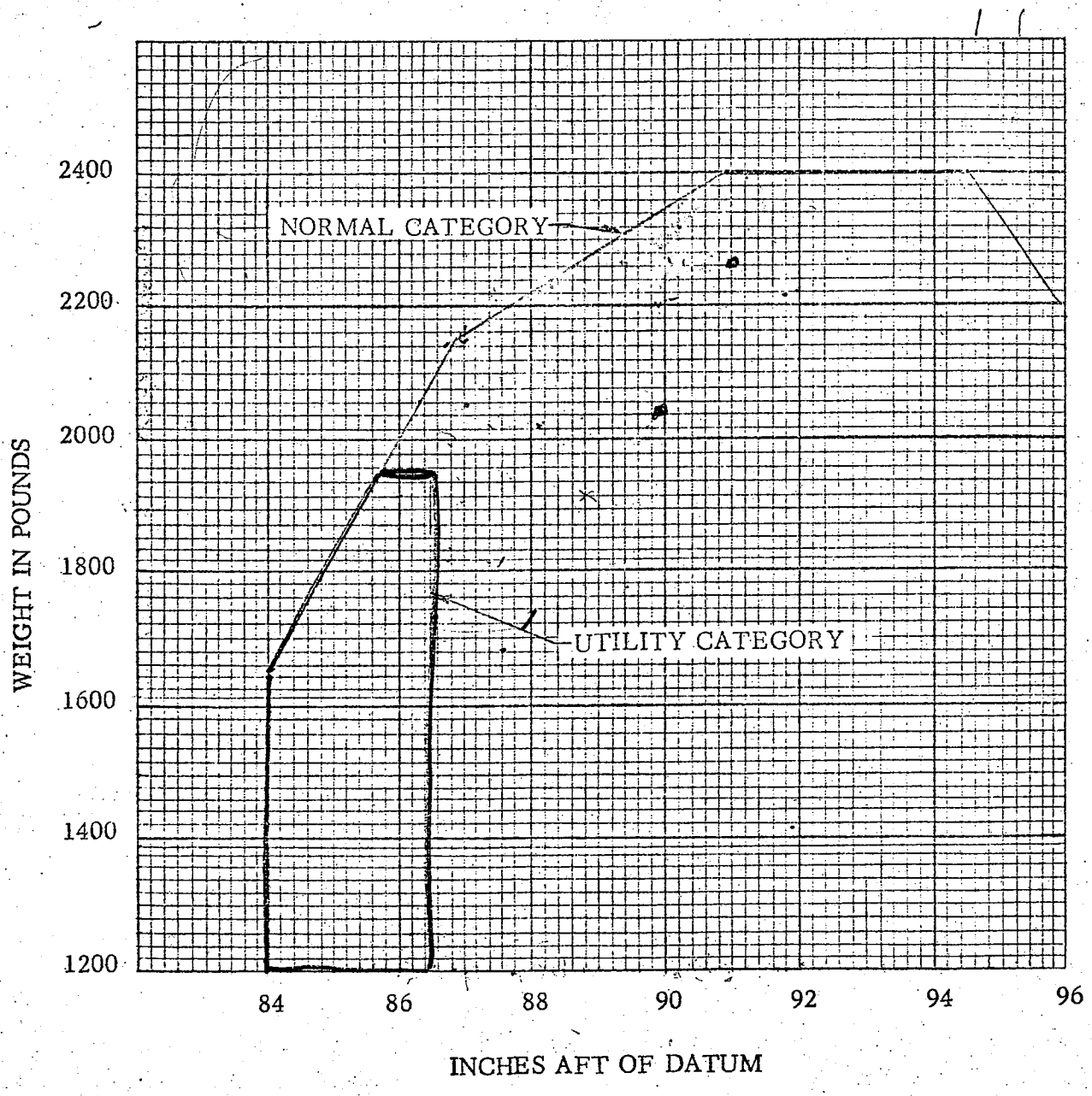
IT IS THE RESPONSIBILITY OF THE PILOT AND AIRCRAFT OWNER TO INSURE THAT THE AIRPLANE IS LOADED PROPERLY.

* Utility Category Operation - No baggage or aft passengers allowed.

LOADING GRAPH



C. G. RANGE AND WEIGHT



WEIGHT AND BALANCE DATA

WEIGHING PROCEDURE

At the time of delivery, Piper Aircraft Corporation provides each airplane with the licensed empty weight and center of gravity location. This data is on Page 1, Section 1 of this Flight Manual.

The removal or addition of an excessive amount of equipment or excessive airplane modifications can affect the licensed empty weight and empty weight center of gravity. The following is a weighing procedure to determine this licensed empty weight and center of gravity location:

1. PREPARATION

   a. Be certain that all items checked in the airplane equipment list are installed in the proper location in the airplane.

   b. Remove excessive dirt, grease, moisture, foreign items such as rags and tools from the airplane before weighing.

   c. Defuel airplane. Then open all fuel drains until all remaining fuel is drained. Operate engine on each tank until all undrainable fuel is used and engine stops.

   d. Drain all oil from the engine, by means of the oil drain, with the airplane in ground attitude. This will leave the undrainable oil still in the system. Engine oil temperature should be in the normal operating range before draining.

   e. Place pilot and co-pilot seats in fourth (4th) notch, aft of forward position. Put flaps in the fully retracted position and all control surfaces in the neutral position. Tow bar should be in the proper location and all entrance and baggage doors closed.

   f. Weigh the airplane inside a closed building to prevent errors in scale readings due to wind.

2. LEVELING

   a. With airplane on scales, block main gear oleo pistons in the fully extended position.

   b. Level airplane (see diagram) by deflating nose wheel tire, to center bubble on level.

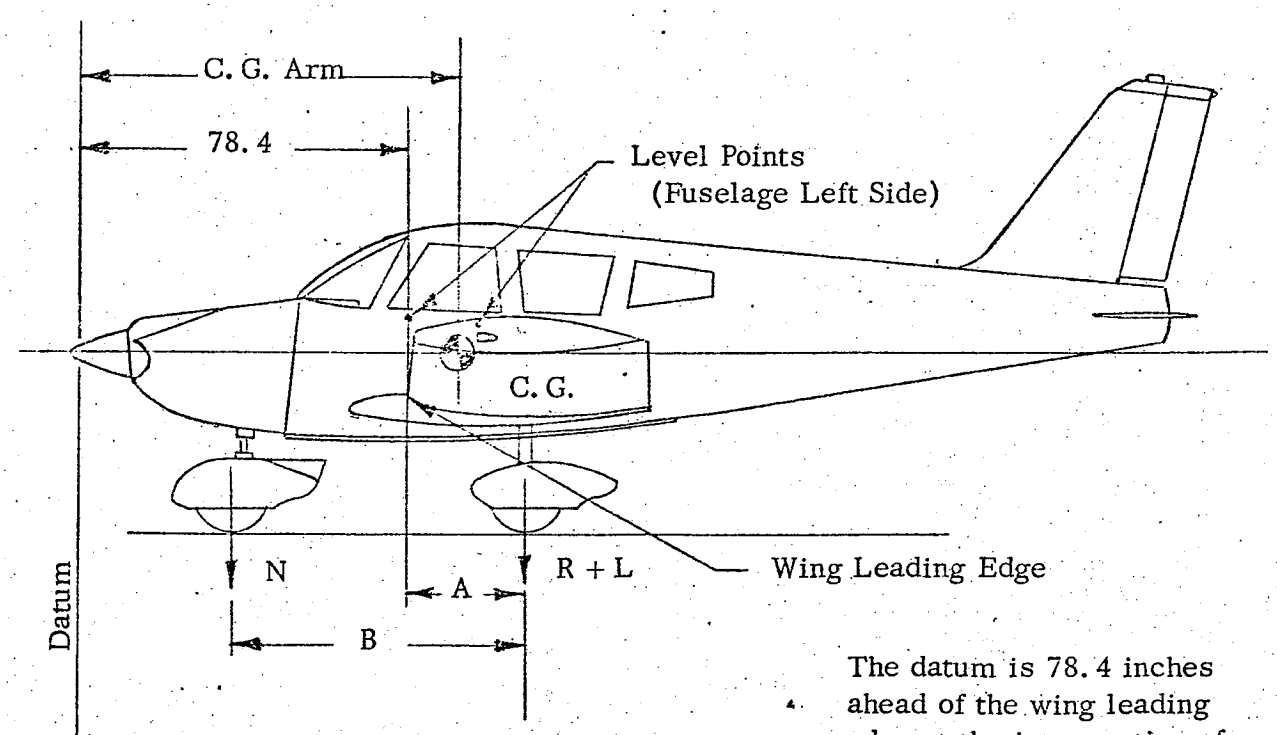
3. WEIGHING - AIRPLANE EMPTY WEIGHT

a. With the airplane level and brakes released, record the weight shown on each scale. Deduct the tare, if any, from each reading.

Scale Position and Symbol		Scale Reading	Tare	Net Weight
Nose Wheel	(N)			
Right Main Wheel	(R)			
Left Main Wheel	(L)			
Airplane Empty Weight, as Weighed (T)				

4. EMPTY WEIGHT CENTER OF GRAVITY

a. The following geometry applies to the PA-28-180 airplane when airplane is level (See Item 2).



The datum is 78. 4 inches ahead of the wing leading edge at the intersection of the straight and tapered section.

A =

B =

b. Obtain measurement "A" by measuring from a plumb bob dropped from the wing leading edge, at the intersection of the straight and tapered section, horizontally and parallel to the airplane centerline, to the main wheel centerline.

c. Obtain measurement "B" by measuring the distance from the main wheel centerline, horizontally and parallel to the airplane centerline, to each side of the nose wheel axle. Then average the measurements.

d. The empty weight center of gravity (as weighed including optional equipment and undrainable oil) can be determined by the following formula:

$$\text{C.G. Arm} = 78.4 + A - \frac{B(N)}{T}$$

C.G. Arm = 78.4 + ( ) - $\frac{(\quad)(\quad)}{(\quad)}$ = inches

5. LICENSED EMPTY WEIGHT AND EMPTY WEIGHT CENTER OF GRAVITY

	Weight	Arm	Moment
Empty Weight (as weighed)			
Unusable Fuel (3 pints)	+ 2.2	103.0	+ 227
Licensed Empty Weight			

WEIGHT AND BALANCE
STANDARD EQUIPMENT LIST
MODEL PA-28-180

Check if Installed	ITEM	WEIGHT (LBS)	ARM AFT DATUM (INCHES)	MOMENT (POUND-INCHES)
	Engine Accessories			
X	Engine - Lycoming Model 0-360-A4A	282.4	26.1	7371
X	Fuel Pump, Electric Auxiliary, Bendix Model 478360	1.8	41.8	75
X	Fuel Pump, Engine Driven, Lycoming Drawing No. 73297, 74082, 75148 or 75246	1.6	41.3	66
X	Oil Cooler, Piper Dwg., Harrison #C-8526250	2.6	18.1	47
X	Air Filter, Fram Model CA-161 PL or Purolator AFP-2	.9	20.1	18
X	Alternator, 60 Amp., Chrysler No. 2642997	12.5	19.0	238
X	Starter-Lycoming 76211 (Prestolite MZ4206) *	18.0	19.5	351
	Propeller and Propeller Accessories			
X	Propeller, Sensenich 76EM8S5-0-60	38.5	8.8	339
X	Spinner and Attachment Plates	4.3	8.0	34

* Included in Engine Weight.

Check if Installed	ITEM	WEIGHT (LBS)	ARM AFT DATUM (INCHES)	MOMENT (POUND-INCHES)
	Landing Gear and Brakes			
X	Two Main Wheel Assemblies	32.3	109.6	3540
	(a) Cleveland Aircraft Products Wheel Assembly No. 40-86 Brake Assembly No. 30-55			
	(b) Two Main 4-Ply Rating Tires 6.00-6 with Regular Tubes			
X	One Nose Wheel 6.00-6	12.5	34.8	435
	(a) Cleveland Aircraft Products Wheel Assembly No. 38501 (Less Brake Drum)			
	(b) One Nose Wheel 4-Ply Rating Tire 6.00-6 with Regular Tube			
	Electrical Equipment			
X	Stall Warning Device, Safe Flight Instrument Corporation No. C52207-4	.2	80.2	16
X	Voltage Regulator, Wico Electric #X-16300B	.5	56.9	28
	Battery 12V, 25A.H., Rebat Model S-25	21.5	168.0	3612
X	Overvoltage Relay, Wico Electric No. X16799	.5	60.4	30

Check if Installed	ITEM	WEIGHT (LBS)	ARM AFT DATUM (INCHES)	MOMENT (POUND-INCHES)
	Instrument			
X	Compass - Piper Drawing 67462	.9	64.9	58
	Airspeed Indicator, Piper Drawing 63205-2	.6	66.8	40
X	Tachometer, Piper Drawing 62177-3	.7	66.2	46
X	Altimeter, Piper Dwg. 99009-2,-3,-4, or-5	1.0	65.9	66
X	Engine Cluster, Piper Drawing 95241-4	.8	67.4	54
X	Engine Cluster, Piper Drawing 95241-2	.8	67.4	54
	Miscellaneous			
X	Forward Seat Belts (2) .75 lbs. each	1.5	86.9	130
X	Inertia Safety Belts (2) 0.9 lbs. each	1.8	119.6	215
X	Rear Seat Belts (2) .70 lbs. each	1.4	123.0	172
X	Rear Seats (2)	27	124.1	3351
X	Flight Manual	---	---	---
~~X~~ removed	Tow Bar	1.3	161.8	210
X	Nose Wheel Fairing - Piper Dwg. 65348	3.8	34.8	132
X	Main Wheel Fairings - Piper Dwg. 65237	7.0	109.6	767

THE ABOVE ITEMS ARE INCLUDED IN THE AIRPLANE STANDARD EMPTY WEIGHT.

OPTIONAL EQUIPMENT LIST
MODEL PA-28-180

Check if Installed	ITEM	WEIGHT (LBS)	ARM AFT DATUM (INCHES)	MOMENT (POUND-INCHES)
	Engine Accessories			
X	Vacuum Pump, Airborne Mechanisms Model No. 10-113A1, 113A5 or 200cc and Drive	5.0	37.0	185
X	Oil Filter-Lycoming No. 75528 (AC #OF5578770)	3.3	40.5	134
X	Vacuum Regulator	.7	57.0	40
X	Vacuum Filter	.3	57.0	17
	Electrical Equipment			
X	Rotating Beacon, Grimes #40-0101-15-12	1.5	263.4	395
X	Landing Light, G.E. Model 4509	.5	18.1	9
X	Navigation Lights (2) Grimes Model A1285 (Red and Green)	.4	106.6	43
X	Navigation Light (Rear)(1) Grimes Model 2064 (White)	.2	281.0	56
X	Battery 12 V, 35 A.H. Rebat R-35 (Weight 27.0 lbs.)	5.5 *	168.0	924

* Weight and Moment difference between standard and optional equipment.

Check if Installed	ITEM	WEIGHT (LBS)	ARM AFT DATUM (INCHES)	MOMENT (POUND-INCHES)
	Electrical Equipment (Cont'd)			
X	Cabin Light	.3	104.0	31
	Cabin Speaker	.8	104.0	83
	Auxiliary Power Receptacle, Piper Dwg. 65647	2.7	178.5	482
	External Power Cable 62355-2	4.6	142.8	657
	Piper Pitch Trim	4.3	155.3	668
X	Heated Pitot Head	.4	100.0	40
	Red Strobe Light, Whelen Engineering Company			
	Power Supply, Whelen Model HS	2.3	198.0	455
	Light (Fin Tip)	.4	263.4	105
	Cable	.4	230.7	92
	Red/White Strobe Light, Whelen Engineering Company			
	Power Supply, Whelen Model HD, T3	3.0	198.0	594
	Light (Fin Tip)	.4	263.4	105
	Cable	.4	230.7	92
	Lights (Wing Tip) (2)	.3	106.6	32
	Cables	2.0	115.6	231
X	STROBE on BELLY	2.5	110.0	

Check if Installed	ITEM	WEIGHT (LBS)	ARM AFT DATUM (INCHES)	MOMENT (POUND-INCHES)
	Instruments			
X	Suction Gauge, Piper Drawing 99480-0 or -2	.5	67.2	34
X	Vertical Speed, Piper Drawing 99010-2, -4 or -5	1.0	65.9	66
	Vertical Speed, Piper Drawing 99010-3	.5	67.2	34
X	Attitude Gyro, Piper Drawing 99002-2, -3, -4 or -5	2.2	64.4	142
X	Directional Gyro, Piper Drawing 99003-2, -3, -4 or -5	2.6	64.7	168
X	Air Temperature Gauge, Piper Drawing 99479-0 or -2	.2	77.6	16
X	Clock, Piper Drawing 99478	.4	67.4	27
X	Tru-Speed Indicator, Piper Dwg. 62143-2 or -13	(Same as Standard Equipment Weight)		
	Turn Coordinator, Piper Drawing 99001	2.6	64.7	168
	Turn Coordinator, Piper Drawing 99004	2.3	64.7	149
	Turn and Bank, Piper Drawing 99005	2.3	64.7	149
	Manifold Pressure Gauge, Piper Dwg. 99006	.9	65.8	59
	Exhaust Gas Temperature, Piper Dwg. 99026	.7	60.4	42

Check if Installed	ITEM	WEIGHT (LBS)	ARM AFT DATUM (INCHES)	MOMENT (POUND-INCHES)
	Auto Pilots			
	AutoControl III			
	Roll Servo, #1C363-1-183R	2.5	122.2	306
	Console, #1C338	1.2	65.1	78
	Cables	.7	95.5	67
	Attitude Gyro, #52D66	2.3	64.4	148
	Directional Gyro, #52D54	3.2	64.0	205
	Omni Coupler, #1C388	.9	64.3	58
X	AutoFlite II			
X	Roll Servo, #1C363-1-183R	2.5	122.2	306
X	Cable	.7	93.4	65
X	Panel Unit, #52D75-3 or -4	2.4	64.4	155

Cont I

PREPARED / CHECKED / APPROVED	PIPER AIRCRAFT CORP. DEVELOPMENT CENTER, VERO BEACH, FLA.	Weight and Balance Data Model PA-28-180
	REPORT VB-268 OPTIONAL EQUIPMENT LIST	PAGE 15 Section 1

Check if Installed	ITEM	WEIGHT (LBS)	ARM AFT DATUM (INCHES)	MOMENT (POUND-INCHES)
	Radio			
X	~~Narco Mark 24 (VHF Comm/Nav)~~ Removed 11-24-80			
X	~~Transceiver, Single~~ Removed 11-24-80	~~8.6~~	~~61.9~~	~~532~~
	Transceiver, Dual	15.0	61.9	929
	Narco Mark 12B (VHF Comm/Nav)			
	Transceiver, Single	5.7	61.9	353
	Transceiver, Dual	11.4	61.9	706
	Modulator-Power Unit, Single	4.0	186.0	744
	Modulator-Power Unit, Dual	8.0	186.0	1488
	Cable, Single Interconnecting	2.0	120.0	240
	Cable, Dual Interconnecting	4.0	120.0	480
	Narco VOA-50M Omni Converter	2.1	64.9	136
	Narco VOA-40(M) Omni Converter	1.9	64.9	123
X	~~Narco VOA-40 Omni Converter~~ Removed 11-24-80	1.9	~~64.9~~	~~123~~
	Genave 200A (VHF Comm/Nav)	5.9	62.7	370
	Genave 300 (VHF Comm/Nav)	5.9	62.7	370
	King KX 170 ( ) (VHF Comm/Nav)			
	Transceiver	7.6	62.2	473
	King KI 201 ( ) Omni Converter	2.5	65.1	163
X	Nav Receiving Antenna	.5	265.0	133
X	Cable, Nav Antenna	.9	157.0	141

Check if Installed	ITEM	WEIGHT (LBS)	ARM AFT DATUM (INCHES)	MOMENT (POUND-INCHES)
	Radio (continued)			
X	#1 VHF Comm Antenna	.5	157.8	79
X	Cable, Antenna #1 VHF	.4	118.0	47
	#2 VHF Comm Antenna	.3	192.8	58
	Cable, Antenna #2 VHF	.5	135.0	68
	Narco ADF-31			
	Panel Unit	5.0	63.5	318
	Sensor Unit	2.5	162.7	407
	Sensor Cable	2.3	105.6	243
	Sense Antenna and Cable	.4	150.0	60
	Bendix ADF-T-12			
	Receiver	3.5	64.4	225
	Audio Amplifier	.8	57.4	46
	Servo Indicator	1.7	65.9	112
	Loop Antenna	1.3	160.8	209
	Cable, Interconnecting	2.3	108.0	248
	Sense Antenna and Cable	.4	150.0	60
	PM-1 Marker Beacon			
	Receiver	1.1	121.3	133
	Remote Unit	.3	128.4	39
	Cable	.3	85.0	26

Check if Installed	ITEM	WEIGHT (LBS)	ARM AFT DATUM (INCHES)	MOMENT (POUND-INCHES)
	Radio (Cont'd)			
	UGR-2 Glide Slope			
	Receiver	2.4	173.8	417
	Cable	1.8	128.0	230
	Antenna	.4	92.4	37
	Cable, Antenna	.5	145.0	73
	Narco UDI-4 DME			
	Receiver	8.5	61.7	524
	Antenna	.3	113.9	34
	Cable, Antenna	.4	100.0	40
	Narco AT6-A Transponder			
	Panel Unit	2.0	64.4	129
	Remote Unit	5.7	203.0	1157
	Antenna and Cable	.3	197.0	59
	Cable, Interconnecting	.4	133.7	53
	I. F. D. Starlight Transponder			
	Panel Unit	2.3	64.4	148
	Antenna	0.1	52.2	5
	Cable	0.3	51.5	15
X	~~TRANSCOIL D120 P2T~~ TERRA AT3000	~~1.2~~ .5	60.0	~~72.0~~ 30.0

Check if Installed	ITEM	WEIGHT (LBS)	ARM AFT DATUM (INCHES)	MOMENT (POUND-INCHES)
	Radio (continued)			
	King KN60C DME			
	Receiver	6.8	61.7	420
	Antenna	.2	112.1	22
	Cable, Antenna	0.3	85.6	26
	Audio Selector Panel, Piper Dwg. 99395-0, -2, or -3	.7	66.3	46
X	Microphone	.5	75.0	38
	Headset	.5	65.0	33
X	SPEAKER	1.3	100.0	130
	Miscellaneous			
X	Removed 12-28-72 Mulcahey Fire Extinguisher - [redacted] (With Brackets) PEM-ALL - MODEL PA27	5.0	85.0 ~~85.0~~	451
	Toe Brakes (Dual)	10.5	54.6	573
+	Toe Brakes (Single) Installed 10-20-88	5.0	54.6	273
X	Assist Step	1.8	156.0	281
	Inertia Safety Belts (Rear) (2) 0.8 lbs. each	1.6	140.3	224
X	Lighter	.2	67.9	14
X	Assist Strap and Coat Hook	.2	109.5	22
X	Adjustable Front Seat (Left)	3.2 *	87.5	280
	Adjustable Front Seat (Right)	3.2 *	87.5	280
	Overhead Vent System	1.2	130.0	156
X	EMERGENCY LOCATOR TRANSMITTER MARTECH MODEL EB-2BCD	3.0	146.4	439.2

* Weight and moment difference between standard and optional equipment.

Check if Installed	ITEM	WEIGHT (LBS)	ARM AFT DATUM (INCHES)	MOMENT (POUND-INCHES)
	Miscellaneous (continued)			
X	Alternate Static Source	.4	66.0	26
	Calibrated Alternate Static Source			
	Placard Required: Yes X No			
	Headrest (2) (Front)	2.0	99.5	199
	Headrest (2) (Rear)	2.0	132.1	264
	TOTAL OPTIONAL EQUIPMENT	35.6	95.8	3410

EXTERIOR FINISH

Base Color Juneau White

Trim Color Lakeland Blue

Accent Color Newport Blue

Registration No. Color Newport Blue

Type Finish Lacquer

MAYDAY AVIONICS, Inc.

Telephone (616) 798-4958 109 Sinclair Drive
Muskegon County Airport
MUSKEGON, MICHIGAN 49441

November 26 1980 ADDITIONAL EQUIPMENT LIST

Cherokee PA-28-180
A/C s/n 28-7205041
Reg. # N-2189T

ITEM	WEIGHT (lbs.)	ARM AFT DATUM (Inches)	MOMENT (Pound-inches)
INSTALLED:			
King KX170B	7.0	61.0	427
King KX170B	7.0	61.0	427
King KI209	1.2	64.0	76.80
King KI208	1.0	64.0	64
King KN75	1.6	56.0	89.60

Garmin International, Inc.
1200 E. 151st Street
Olathe, Kansas 66062 U.S.A.

FAA APPROVED

AIRPLANE FLIGHT MANUAL SUPPLEMENT
or
SUPPLEMENTAL AIRPLANE FLIGHT MANUAL

for the

Garmin GTN 625, 635, 650, 725, or 750 GPS/SBAS Navigation System

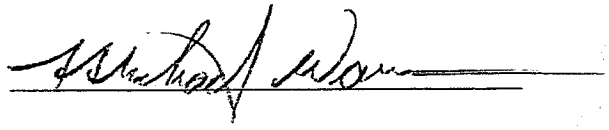
as installed in

Piper PA-28-180
Make and Model Airplane

Registration Number: N2189T Serial Number: 28-7205041

This document serves as an Airplane Flight Manual Supplement or as a Supplemental Airplane Flight Manual when the aircraft is equipped in accordance with Supplemental Type Certificate SA02019SE-D for the installation and operation of the Garmin GTN 625, 635, 650, 725, or 750 GPS/SBAS Navigation System. This document must be incorporated into the FAA Approved Airplane Flight Manual or provided as an FAA Approved Supplemental Airplane Flight Manual.

The information contained herein supplements the information in the FAA Approved Airplane Flight Manual. For limitations, procedures, loading and performance information not contained in this document, refer to the FAA Approved Airplane Flight Manual, markings, or placards.

FAA Approved By: 

Michael Warren
ODA STC Unit Administrator
Garmin International, Inc.
ODA-240087-CE

Date: 12-APR-2013

LOG OF REVISIONS				
	Page			
Revision Number	Date	Number	Description	FAA Approved
1	03/18/11	All	Complete Supplement	Robert Grove Robert Grove ODA STC Unit Administrator GARMIN International, Inc. ODA-240087-CE Date: 3/18/11
2	12/18/12	6	Table 1 • Added new functions	See Page 1
		8	Section 1.2 • Added capabilities checkboxes • Added GPS approaches without vertical • Added reference to EASA AMC 20-4	
		10	Section 1.3 • Removed suggestion for secondary charts • Changed to Type B Software in accordance with AC 120-76B.	
		10	Section 1.4 • Added ADS-B, AEG, FIS-B, NOTAM, TFR	
		12	Section 2.2 • Removed VFR only limitation	
		12	Section 2.3 • Clarified secondary navigation source requirement	

LOG OF REVISIONS				
	Page			
Revision Number	Date	Number	Description	FAA Approved
		18	Section 2.14 • Modified datalinked weather limitations	
		18	Section 2.16 • Modified limitation	
		19	Section 2.17 • Modified limitation	
		19	Section 2.21 • New limitation	
		24 & 25	Section 3.2.8 and 3.2.9 • Modified section title	
		25	Section 3.2.10 • New section	
		26	Section 4.1 • Added telephone audio deactivation	
		27	Section 4.3 • Modified caution statement	
		27	Section 4.4 • Added caution statement	
		29	Section 4.6 • New section	
		31	Section 7.7 • Added TCAD and GDL 88 as optional traffic systems	
		32	Section 7.8 • Modified Heading Not Available operation	
		34 - 35	Sections 7.12 – 7.16 • New sections	

3	03/26/13	20	Section 2.17 • Modified limitation	See Page 1

Table of Contents

Section 1. GENERAL

1.1 Garmin GTN Navigators

The Garmin GTN navigation system is a GPS system with a Satellite Based Augmentation System (SBAS), comprised of one or more Garmin TSO-C146c GTN 625, 635, 650, 725, or 750 navigator(s) and one or more Garmin approved GPS/SBAS antenna(s). The GTN navigation system is installed in accordance with AC 20-138A.

GTN system functions are shown in Table 1.

	GTN 625	GTN 635	GTN 650	GTN 725	GTN 750
GPS SBAS Navigation: • Oceanic, enroute, terminal, and non-precision approach guidance • Precision approach guidance (LP, LPV)	X	X	X	X	X
VHF Com Radio, 118.00 to 136.990, MHz, 8.33 or 25 kHz increments		X	X		X
VHF Nav Radio, 108.00 to 117.95 MHz, 50 kHz increments			X		X
LOC and Glideslope non-precision and precision approach guidance for Cat 1 minimums, 328.6 to 335.4 MHz tuning range			X		X
Moving map including topographic, terrain, aviation, and geopolitical data	X	X	X	X	X
Display of datalink weather products, SiriusXM, FIS-B, Connext (all optional)	X	X	X	X	X
Control and display of airborne weather radar (optional)				X	X
Display of terminal procedures data (optional)				X	X
Display of traffic data, including ADS-B (optional)	X	X	X	X	X
Display of StormScope® data (optional)	X	X	X	X	X
Display of marker beacon annunciators (optional)				X	X
Remote audio panel control (optional)				X	X
Remote transponder control (optional)	X	X	X	X	X
Remote audio entertainment datalink control (optional)	X	X	X	X	X
TSO-C151b Class B TAWS (optional)	X	X	X	X	X
Supplemental calculators and timers	X	X	X	X	X
Control of GSR 56 Iridium Satellite Phone and SMS Text	X	X	X	X	X

Table 1 – GTN Functions

The GPS navigation functions and optional VHF communication and navigation radio functions are operated by dedicated hard keys, a dual concentric rotary knob, or the touchscreen.

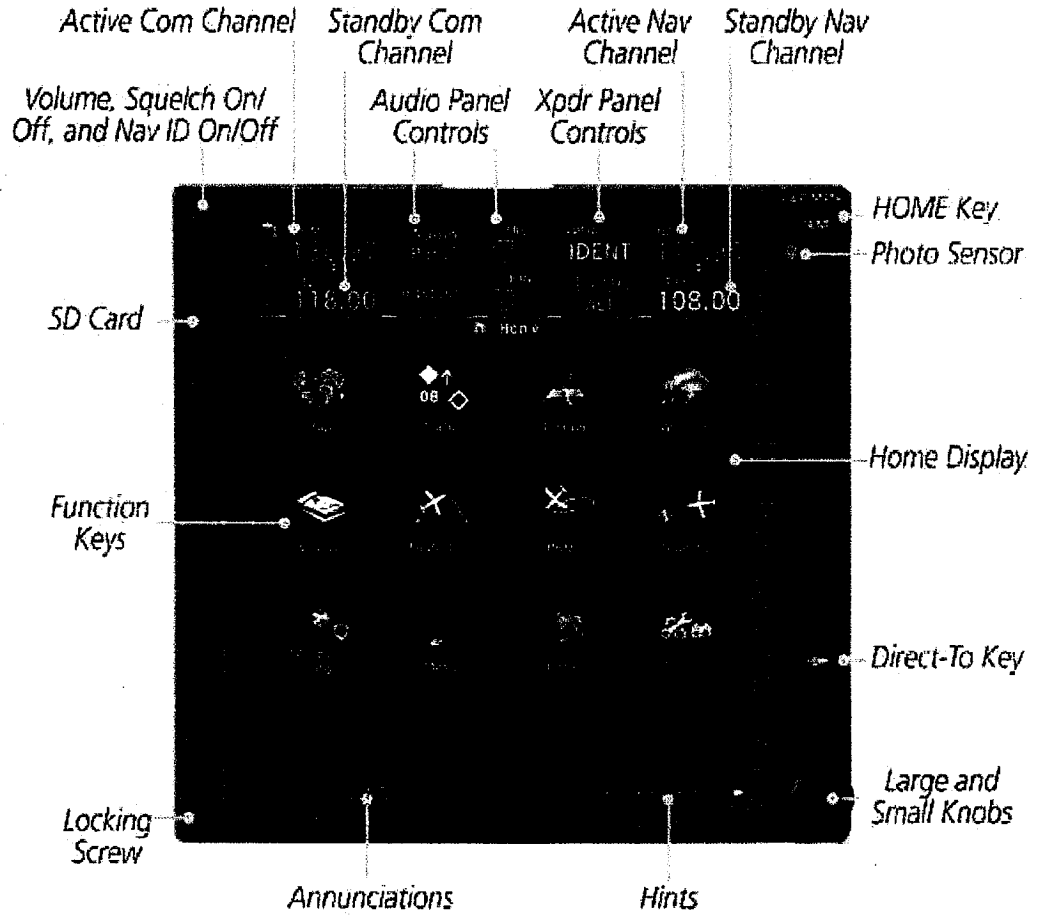


Figure 1 - GTN 750 Control and Display Layout

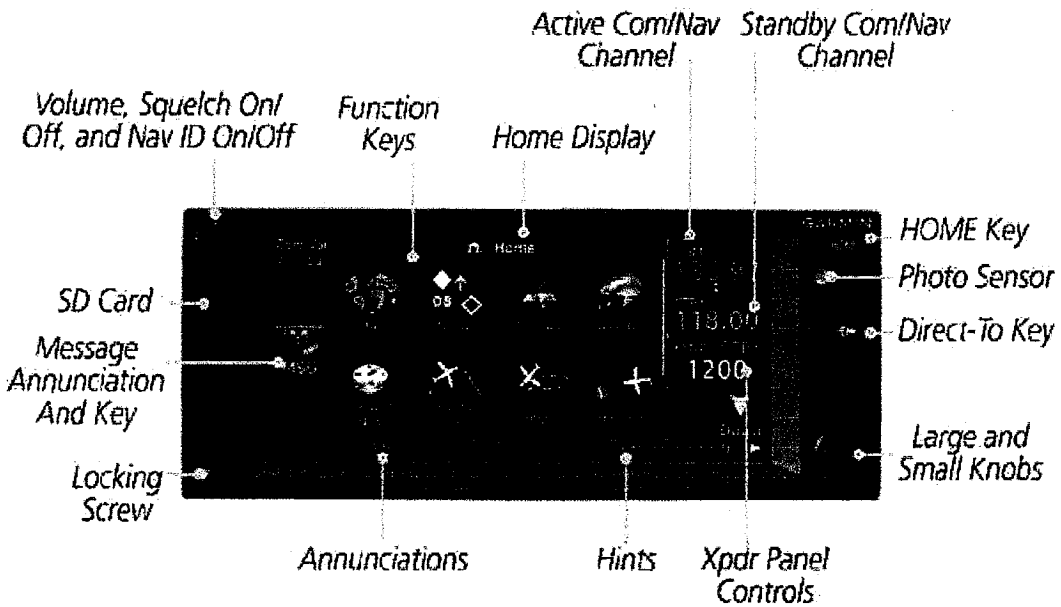


Figure 2 - GTN 635/650 Control and Display Layout

1.2 System Capabilities

The GTN system and associated navigation interface in this aircraft have the following capabilities, in addition to the core multifunction display capability:

- ☐ VHF Communication Radio
- ☐ Primary VHF Navigation
- ☐ Primary GPS Navigation (Enroute) and Approach Capability (LP/LNAV) – See below
- ☐ Primary GPS Approach Capability with Vertical Guidance (LNAV/VNAV, LPV) – See below
- ☐ TSO-C151b Terrain Awareness and Warning System – See section 2.13

GPS/SBAS TSO-C146c Class 3 Operation

The GTN complies with AC 20-138A and has airworthiness approval for navigation using GPS and SBAS (within the coverage of a Satellite Based Augmentation System complying with ICAO Annex 10) for IFR en route, terminal area, and non-precision approach operations (including those approaches titled "GPS", "or GPS", and "RNAV (GPS)" approaches). The Garmin GNSS navigation system is composed of the GTN navigator and antenna, and is approved for approach procedures with vertical guidance including "LPV" and "LNAV/VNAV" and without vertical guidance including "LP" and "LNAV," within the U.S. National Airspace System.

The Garmin GNSS navigation system complies with the equipment requirements of AC 90-105 and meets the equipment performance and functional requirements to conduct RNP terminal departure and arrival procedures and RNP approach procedures without RF (radius to fix) legs. Part 91 subpart K, 121, 125, 129, and 135 operators require operational approval from the FAA.

The Garmin GNSS navigation system complies with the equipment requirements of AC 90-100A for RNAV 2 and RNAV 1 operations. In accordance with AC 90-100A, Part 91 operators (except subpart K) following the aircraft and training guidance in AC 90-100A are authorized to fly RNAV 2 and RNAV 1 procedures. Part 91 subpart K, 121, 125, 129, and 135 operators require operational approval from the FAA.

Applicable to dual installations consisting of two Garmin GNSS units: The Garmin GNSS navigation system has been found to comply with the requirements for GPS Class II oceanic and remote navigation (RNP-10) without time limitations in accordance with AC 20-138A and FAA Order 8400.12A. The Garmin GNSS navigation system can be used without reliance on other long-range navigation systems. This does not constitute an operational approval.

The Garmin GNSS navigation system has been found to comply with the navigation requirements for GPS Class II oceanic and remote navigation (RNP-4) in accordance with AC 20-138A and FAA Order 8400.33. The Garmin GNSS navigation system can be used without reliance on other long-range navigation systems. Additional equipment may be required to obtain operational approval to utilize RNP-4 performance. This does not constitute an operational approval.

The Garmin GNSS navigation system complies with the accuracy, integrity, and continuity of function, and contains the minimum system functions required for P-RNAV operations in accordance with JAA Administrative & Guidance Material Section One: General Part 3: Temporary Guidance Leaflets, Leaflet No 10 (JAA TGL-10 Rev 1). The GNSS navigation system has one or more TSO-C146c Class 3 approved Garmin GTN Navigation Systems. The Garmin GNSS navigation system complies with the accuracy, integrity, and continuity of function, and contains the minimum system functions required for B-RNAV operations in accordance with EASA AMC 20-4. The Garmin GNSS navigation system complies with the equipment requirements for P-RNAV and B-RNAV/RNAV-5 operations in accordance with AC 90-96A CHG 1. This does not constitute an operational approval.

Garmin International holds an FAA Type 2 Letter of Acceptance (LOA) in accordance with AC 20-153 for database integrity, quality, and database management practices for the navigation database. Flight crew and operators can view the LOA status at FlyGarmin.com then select "Type 2 LOA Status."

Navigation information is referenced to the WGS-84 reference system.

Note that for some types of aircraft operation and for operation in non-U.S. airspace, separate operational approval(s) may be required in addition to equipment installation and airworthiness approval.

1.3 Electronic Flight Bag

The GTN 750/725 are operationally suitable as Class 3 Hardware, Type B Software in accordance with AC 120-76B EFB electronic aeronautical information when using current FliteChart or ChartView data.

1.4 Definitions

The following terminology is used within this document:

ADF:	Automatic Direction Finder
ADS-B:	Automatic Dependent Surveillance Broadcast
AEG:	Aircraft Evaluation Group (FAA)
APR:	Approach
CDI:	Course Deviation Indicator
DME:	Distance Measuring Equipment
EFB:	Electronic Flight Bag
EHSI:	Electronic Horizontal Situation Indicator
FIS-B:	Flight Information Services Broadcast
GNSS:	Global Navigation Satellite System
GPS:	Global Positioning System
GPSS:	GPS Roll Steering
GTN:	Garmin Touchscreen Navigator
HSI:	Horizontal Situation Indicator
IAP:	Instrument Approach Procedure
IFR:	Instrument Flight Rules
ILS:	Instrument Landing System
IMC:	Instrument Meteorological Conditions
LDA:	Localizer Directional Aid
LNAV:	Lateral Navigation
LNAV+V:	Lateral Navigation with advisory Vertical Guidance
L/VNAV:	Lateral/Vertical Navigation
LOC:	Localizer
LOC-BC:	Localizer Backcourse
LP:	Localizer Performance
LPV:	Localizer Performance with Vertical Guidance
MLS:	Microwave Landing System
NOTAM:	Notice to Airmen
OBS:	Omnibearing Select
RAIM:	Receiver Autonomous Integrity Monitoring

RMT:	Remote
RNAV:	Area Navigation
RNP:	Required Navigational Performance
SBAS:	Satellite Based Augmentation System
SD:	Secure Digital
SDF:	Simplified Directional Facility
SUSP:	Suspend
TACAN:	Tactical Air Navigation System
TAS:	Traffic Awareness System
TAWS:	Terrain Awareness and Warning System
TCAS:	Traffic Collision Avoidance System
TFR:	Temporary Flight Restriction
TIS:	Traffic Information Service
VHF:	Very High Frequency
VFR:	Visual Flight Rules
VLOC:	VOR/Localizer
VMC:	Visual Meteorological Conditions
VOR:	VHF Omnidirectional Range
WAAS:	Wide Area Augmentation System
WFDE:	WAAS Fault Data Exclusion
XFR:	Transfer

Section 2. LIMITATIONS

2.1 Cockpit Reference Guide

The Garmin GTN 6XX or GTN 7XX Cockpit Reference Guide, part number and revision listed below (or later revisions), *must* be immediately available to the flight crew whenever navigation is predicated on the use of the GTN.

- GTN 6XX Cockpit Reference Guide P/N 190-01004-04 Rev C
- GTN 7XX Cockpit Reference Guide P/N 190-01007-04 Rev C

2.2 Kinds of Operation

This AFM supplement does not grant approval for IFR operations to aircraft limited to VFR operations.

2.3 Minimum Equipment

The GTN must have the following system interfaces fully functional in order to be used for primary navigation during IFR operations:

Interfaced Equipment	Number installed	Number Required for IFR
External HSI/CDI/EHSI	1 or more	1
External GPS Annunciator	See Note 1	1

Table 2 – Required Equipment

Note 1: Certain installations require an external GPS annunciator panel. If installed, this annunciator must be fully functional to use the GTN GPS navigation for IFR operations.

Single engine piston aircraft under 6,000 lbs maximum takeoff weight:
Required Equipment for IFR operations utilizing GPS navigation: Single GTN Navigator

All other aircraft:
Required Equipment for IFR operations utilizing GPS navigation: Single GTN Navigator plus a second source of GPS navigation or a separate source of VHF navigation. The separate source of VHF navigation must not be the primary GTN, but it may be a secondary GTN.

Operation in remote or oceanic operation requires two sources of GPS navigation.

2.4 Flight Planning

For flight planning purposes, in areas where SBAS coverage is not available, the flight crew must check RAIM availability.

- Within the United States, RAIM availability can be determined using the Garmin WFDE Prediction program, Garmin part number 006-A0154-04 (included in GTN trainer) software version 3.00 or later approved version with Garmin approved antennas or the FAA's en route and terminal RAIM prediction website: www.raimprediction.net, or by contacting a Flight Service Station.
- Within Europe, RAIM availability can be determined using the Garmin WFDE Prediction program or Europe's AUGER GPS RAIM Prediction Tool at http://augur.ecacnav.com/augur/app/home.
- For other areas, use the Garmin WFDE Prediction program.

This RAIM availability requirement is not necessary if SBAS coverage is confirmed to be available along the entire route of flight. The route planning and WFDE prediction program may be downloaded from the Garmin website on the internet. For information on using the WFDE Prediction Program, refer to Garmin WAAS FDE Prediction Program, part number 190-00643-01, 'WFDE Prediction Program Instructions'.

For flight planning purposes, for operations within the U.S. National Airspace System on RNP and RNAV procedures when SBAS signals are not available, the availability of GPS RAIM shall be confirmed for the intended route of flight. In the event of a predicted continuous loss of RAIM of more than five minutes for any part of the intended route of flight, the flight shall be delayed, canceled, or rerouted on a track where RAIM requirements can be met. The flight may also be re-planned using non-GPS based navigational capabilities.

For flight planning purposes for operations within European B-RNAV/RNAV-5 and P-RNAV airspace, if more than one satellite is scheduled to be out of service, then the availability of GPS RAIM shall be confirmed for the intended flight (route and time). In the event of a predicted continuous loss of RAIM of more than five minutes for any part of the intended flight, the flight shall be delayed, canceled, or rerouted on a track where RAIM requirements can be met.

Applicable to dual installations consisting of two Garmin GNSS units:

For flight planning purposes, for operations where the route requires Class II navigation the aircraft's operator or flight crew must use the Garmin WFDE Prediction program to demonstrate that there are no outages on the specified route that would prevent the Garmin GNSS navigation system to provide GPS Class II navigation in oceanic and remote areas of operation that requires RNP-10 or RNP-4 capability. If the Garmin WFDE Prediction program indicates fault exclusion (FDE) will be unavailable for more than 34 minutes in accordance with FAA Order 8400.12A for RNP-10 requirements, or 25 minutes in accordance

with FAA Order 8400.33 for RNP-4 requirements, then the operation must be rescheduled when FDE is available.

Both Garmin GPS navigation receivers must be operating and providing GPS navigation guidance for operations requiring RNP-4 performance.

North Atlantic (NAT) Minimum Navigational Performance Specifications (MNPS) Airspace operations per AC 91-49 and AC 120-33 require both GPS/SBAS receivers to be operating and receiving usable signals except for routes requiring only one Long Range Navigation sensor. Each display computes an independent navigation solution based on its internal GPS receiver.

Whenever possible, RNP and RNAV routes including Standard Instrument Departures (SIDs), Standard Terminal Arrival (STAR), and enroute RNAV "Q" and RNAV "T" routes should be loaded into the flight plan from the database in their entirety, rather than loading route waypoints from the database into the flight plan individually. Selecting and inserting individual named fixes from the database is permitted, provided all fixes along the published route to be flown are inserted. Manual entry of waypoints using latitude/longitude or place/bearing is prohibited.

It is not acceptable to flight plan a required alternate airport based on RNAV(GPS) LP/LPV or LNAV/VNAV approach minimums. The required alternate airport must be flight planned using an LNAV approach minimums or available ground-based approach aid.

Navigation information is referenced to the WGS-84 reference system, and should only be used where the Aeronautical Information Publication (including electronic data and aeronautical charts) conform to WGS-84 or equivalent.

2.5 System Use

In installations with two GTNs and an external GPS annunciator (See Table 2) the GTN connected to the external GPS annunciator must be used as the navigation source for all IFR operations.

The only approved sources of course guidance are on the external CDI, HSI, or EHSI display. The moving map and CDI depiction on the GTN display are for situational awareness only and are not approved for course guidance.

2.6 Applicable System Software

This AFMS/AFM is applicable to the software versions shown in Table 3.

The Main and GPS software versions are displayed on the start-up page immediately after power-on. All software versions displayed in Table 3 can be viewed on the System – System Status page.

Software Item	**Software Version** *(or later FAA Approved versions for this STC)*
Main SW Version	4.10
GPS SW Version	5.0
Com SW Version	2.10
Nav SW Version	6.02

Table 3 - Software Versions

2.7 SD Card

It is required that the SD card be present in the unit at all times.

2.8 Navigation Database

GPS/SBAS based IFR enroute, oceanic, and terminal navigation is prohibited unless the flight crew verifies and uses a valid, compatible, and current navigation database or verifies each waypoint for accuracy by reference to current approved data.

"GPS", "or GPS", and "RNAV (GPS)" instrument approaches using the Garmin navigation system are prohibited unless the flight crew verifies and uses the current navigation database. GPS based instrument approaches must be flown in accordance with an approved instrument approach procedure that is loaded from the navigation database.

Discrepancies that invalidate a procedure should be reported to Garmin International. The affected procedure is prohibited from being flown using data from the navigation database until a new navigation database is installed in the aircraft and verified that the discrepancy has been corrected. Navigation database discrepancies can be reported at FlyGarmin.com by selecting "Aviation Data Error Report." Flight crew and operators can view navigation database alerts at FlyGarmin.com then select "NavData Alerts."

If the navigation database cycle will change during flight, the flight crew must ensure the accuracy of navigation data, including suitability of navigation facilities used to define the routes and procedures for flight. If an amended chart affecting navigation data is published for the procedure, the database must not be used to conduct the procedure.

2.9 Ground Operations

Do not use SafeTaxi or Chartview functions as the basis for ground maneuvering. SafeTaxi and Chartview functions do not comply with the requirements of AC 20-159 and are not qualified to be used as an airport moving map display (AMMD). SafeTaxi and Chartview are to be used by the flight crew to orient themselves on the airport surface to improve flight crew situational awareness during ground operations.

2.10 Approaches

a) Instrument approaches using GPS guidance may only be conducted when the GTN is operating in the approach mode. (LNAV, LNAV+V, L/VNAV, LPV, or LP)

b) When conducting instrument approaches referenced to true North, the NAV Angle on the System -Units page must be set to **True**.

c) The navigation equipment required to join and fly an instrument approach procedure is indicated by the title of the procedure and notes on the IAP chart. Navigating the final approach segment (that segment from the final approach fix to the missed approach point) of an ILS, LOC, LOC-BC, LDA, SDF, MLS, VOR, TACAN approach, or any other type of approach not approved for GPS, is not authorized with GPS navigation guidance. GPS guidance can only be used for approach procedures with GPS or RNAV in the procedure title. When using the Garmin VOR/LOC/GS receivers to fly the final approach segment, VOR/LOC/GS navigation data must be selected and presented on the CDI of the pilot flying.

d) Advisory vertical guidance deviation is provided when the GTN annunciates LNAV + V. Vertical guidance information displayed on the VDI in this mode is only an aid to help flight crews comply with altitude restrictions. When using advisory vertical guidance, the flight crew must use the primary barometric altimeter to ensure compliance with all altitude restrictions.

e) Not all published Instrument Approach Procedures (IAP) are in the navigation database. Flight crews planning to fly an RNAV instrument approach must ensure that the navigation database contains the planned RNAV Instrument Approach Procedure and that approach procedure must be loaded from the navigation database into the GTN system flight plan by its name. Users are prohibited from flying any approach path that contains manually entered waypoints.

f) IFR approaches are prohibited whenever any physical or visual obstruction (such as a throw-over yoke) restricts pilot view or access to the GTN and/or the CDI.

2.11 Autopilot Coupling

The flight crew may fly all phases of flight based on the navigation information presented to the flight crew; however, not all modes may be coupled to the autopilot. All autopilots may be coupled in Oceanic (OCN), Enroute (ENR), and Terminal (TERM) modes.

This installation is limited to:

- ☐ Lateral coupling only for GPS approaches. Coupling to the vertical path for GPS approaches is not authorized.

2.12 Terrain Proximity Function (All Units)

Terrain and obstacle information appears on the map and terrain display pages as red and yellow tiles or towers, and is depicted for advisory use only. Aircraft maneuvers and navigation must not be predicated upon the use of the terrain display. Terrain and obstacle information is advisory only and is not equivalent to warnings provided by TAWS.

The terrain display is intended to serve as a situational awareness tool only. By itself, it may not provide either the accuracy or the fidelity on which to base decisions and plan maneuvers to avoid terrain or obstacles.

NOTE

Terrain and TAWS are separate features and mutually exclusive. If "TAWS B" is shown on the bottom right of the dedicated terrain page, then TAWS is installed.

2.13 TAWS Function (Optional)

Flight crews are authorized to deviate from their current ATC clearance to the extent necessary to comply with TAWS warnings. Navigation must not be predicated upon the use of TAWS.

If an external TAWS annunciator panel is installed in the aircraft, this annunciator panel must be fully functional in order to use the TAWS system.

NOTE

Terrain and TAWS are separate features and mutually exclusive. If "TAWS B" is shown on the bottom right of the dedicated terrain page, then TAWS is installed.

2.14 Datalinked Weather Display (Optional)

This limitation applies to datalinked weather products from SiriusXM via a GDL 69/69A, FIS-B via a GDL 88, and Connext via a GSR 56.

Do not use data link weather information for maneuvering in, near, or around areas of hazardous weather. Information provided by data link weather products may not accurately depict current weather conditions.

Do not use the indicated data link weather product age to determine the age of the weather information shown by the data link weather product. Due to time delays inherent in gathering and processing weather data for data link transmission, the weather information shown by the data link weather product may be significantly older than the indicated weather product age.

Do not rely solely upon data link services to provide Temporary Flight Restriction (TFR) or Notice to Airmen (NOTAM) information. Not all TFRs and NOTAMS can be depicted on the GTN.

2.15 Traffic Display (Optional)

Traffic may be displayed on the GTN when connected to an approved optional TCAS I, TAS, TIS, or ADS-B traffic device. These systems are capable of providing traffic monitoring and alerting to the flight crew. Traffic shown on the display may or may not have traffic alerting available. The display of traffic is an aid to visual acquisition and may not be utilized for aircraft maneuvering.

2.16 StormScope® Display (Optional)

StormScope® lightning information displayed by the GTN is limited to supplemental use only. The use of the StormScope® lightning data on the display for hazardous weather (thunderstorm) penetration is prohibited. StormScope® lightning data on the display is intended only as an aid to enhance situational awareness of hazardous weather, not penetration. It is the flight crew's responsibility to avoid hazardous weather using official weather data sources.

When the GTN StormScope® page is operating without a heading source, as indicated by the "HDG N/A" label at the upper right corner of the StormScope® page, strikes must be cleared after each heading change.

2.17 Flight Planner/Calculator Functions

The Fuel Planning page uses Fuel on Board or Fuel Flow as received from an on board fuel totalizer, as entered by the pilot at system startup, or as entered by the pilot when on the Fuel Planning page. This *is not* a direct indication of actual aircraft fuel flow or fuel on board and those values are only used for the Fuel Planning page. The fuel required to destination is only a calculated and predicted value based on the data entered into the planner. It is not a direct indication of how much fuel the aircraft will have upon reaching the destination.

2.18 Glove Use / Covered Fingers

No device may be used to cover fingers used to operate the GTN unless the Glove Qualification Procedure located in the Pilot's Guide/Cockpit Reference Guide has been successfully completed. The Glove Qualification Procedure is specific to a pilot / glove / GTN 725, 750 or GTN 625, 635, 650 combination.

2.19 Demo Mode

Demo mode may not be used in flight under any circumstances.

2.20 Active Weather Radar

Radar is broadcasting energy while in Weather or Ground mapping modes. If the GTN 750/725 system is configured to control an airborne weather radar unit, observe all safety precautions, including:

- Do not operate in the vicinity of refueling operations.
- Do not operate while personnel are in the vicinity (approximately 20 feet) of the radar sweep area.

CAUTION

If a radar system is installed, it generates microwave radiation and improper use, or exposure, may cause serious bodily injury. Do not operate the radar equipment until you have read and carefully followed the safety precautions and instructions in the weather radar user manual and/or pilot's guide.

2.21 Telephone Audio

Telephone audio may not be distributed to the pilot or co-pilot unless a phone call is active.

3.1 Emergency Procedures

3.1.1 TAWS WARNING

Red annunciator and aural "PULL UP":

Autopilot ..... **DISCONNECT**
Aircraft Controls ..... **INITIATE MAXIMUM POWER CLIMB**
Airspeed ..... **BEST ANGLE OF CLIMB SPEED**

After Warning Ceases:

Power ..... **MAXIMUM CONTINUOUS**
Altitude ..... **CLIMB AND MAINTAIN SAFE ALTITUDE**
Advise ATC of Altitude Deviation, if appropriate.

NOTE

Only vertical maneuvers are recommended, unless either operating in visual meteorological conditions (VMC), or the flight crew determines, based on all available information, that turning in addition to the vertical escape maneuver is the safest course of action, or both.

3.2 Abnormal Procedures

3.2.1 LOSS OF GPS/SBAS NAVIGATION DATA

When the GPS/SBAS receiver is inoperative or GPS navigation information is not available or invalid, the GTN will enter one of two modes: Dead Reckoning mode (DR) or Loss Of Integrity mode (LOI). The mode is indicated on the GTN by an amber "DR" or "LOI".

If the Loss Of Integrity annunciation is displayed, revert to an alternate means of navigation appropriate to the route and phase of flight.

If the Dead Reckoning annunciation is displayed, the map will continue to be displayed with an amber 'DR' overwriting the ownship icon. Course guidance will be removed on the CDI. Aircraft position will be based upon the last valid GPS position, then estimated by Dead Reckoning methods. Changes in true airspeed, altitude, heading, or winds aloft can affect the estimated position substantially. Dead Reckoning is only available in Enroute and Oceanic modes. Terminal and Approach modes do not support Dead Reckoning.

If Alternate Navigation Sources (ILS, LOC, VOR, DME, ADF) Are Available:

Navigation..... **USE ALTERNATE SOURCES**

If No Alternate Navigation Sources Are Available:

DEAD RECKONING (DR) MODE:

Navigation..... **USE GTN**

NOTE

All information normally derived from GPS will become less accurate over time.

LOSS OF INTEGRITY (LOI) MODE:

Navigation.....**FLY TOWARDS KNOWN VISUAL CONDITIONS**

NOTE

All information derived from GPS will be removed.

NOTE

The airplane symbol is removed from all maps. The map will remain centered at the last known position. "NO GPS POSITION" will be annunciated in the center of the map.

3.2.2 GPS APPROACH DOWNGRADE

During a GPS LPV, LNAV/VNAV, or LNAV+V approach, if GPS accuracy requirements cannot be met by the GPS receiver, the GTN will downgrade the approach. The downgrade will remove vertical deviation indication from the VDI and change the approach annunciation accordingly from LPV, L/VNAV, or LNAV+V to LNAV. The approach may be continued using the LNAV only minimums.

During a GPS approach in which GPS accuracy requirements cannot be met by the GPS receiver for any GPS approach type, the GTN will flag all CDI guidance and display a system message "ABORT APPROACH-GPS approach no longer available". Immediately upon viewing the message, the unit will revert to Terminal navigation mode alarm limits. If the position integrity is within these limits lateral guidance will be restored and the GPS may be used to execute the missed approach, otherwise alternate means of navigation must be utilized.

3.2.3 LOSS OF COM RADIO TUNING FUNCTIONS

If alternate COM is available:

Communications ..... **USE ALTERNATE COM**

If no alternate COM is available:

COM RMT XFR key (if installed)..... **PRESS AND HOLD FOR 2 SECONDS**

NOTE

This procedure will tune the active COM radio the emergency frequency 121.5, regardless of what frequency is displayed on the GTN. Certain failures of the tuning system will automatically tune 121.5 without flight crew action.

3.2.4 LOSS OF AUDIO PANEL FUNCTIONS (GMA 35 Only)

Audio Panel Circuit Breaker ..... **PULL**

NOTE

This procedure will force the audio panel into fail safe mode which provides only the pilot with communications and only on a single COM radio. If any non GTN 750 COM is installed, communication will be only on that radio. If only a GTN 750 is installed in the aircraft, then the pilot will have only the GTN 750 COM available. No other audio panel functions including the crew and passenger intercom will function.

3.2.5 TAWS CAUTION (Terrain or Obstacle Ahead, Sink Rate, Don't Sink)

When a TAWS CAUTION occurs, take corrective action until the alert ceases. Stop descending or initiate either a climb or a turn, or both as necessary, based on analysis of all available instruments and information.

3.2.6 TAWS INHIBIT

The TAWS Forward Looking Terrain Avoidance (FLTA) and Premature Descent Alerts (PDA) functions may be inhibited to prevent alerting, if desired. Refer to GTN Cockpit Reference Guide for additional information.

To Inhibit TAWS:

Home Hardkey ..... PRESS
Terrain Button ..... PRESS
Menu Button ..... PRESS
TAWS Inhibit Button ..... PRESS TO ACTIVATE

3.2.7 TER N/A and TER FAIL

If the amber **TER N/A** or **TER FAIL** status annunciator is displayed, the system will no longer provide TAWS alerting or display relative terrain and obstacle elevations. The crew must maintain compliance with procedures that ensure minimum terrain and obstacle separation.

3.2.8 DATA SOURCE - HEADING SOURCE INOPERATIVE OR CONNECTION TO GTN LOST MESSAGE

Without a heading source to the GTN, the following features will not operate:

- GPSS will not be provided to the autopilot for heading legs. The autopilot must be placed in HDG mode for heading legs.
- Map cannot be oriented to Heading Up.
- All overlaying traffic data from a TAS/TCAS I or GDL 88 interfaced to an on board traffic system on the main map display. The flight crew must use the dedicated traffic page on the GTN system to display TAS/TCAS I or GDL 88 traffic data.
- All overlaying StormScope® data on the main map display. The flight crew must use the dedicated StormScope® page on the GTN system to display StormScope® data.

StormScope® must be operated in accordance with Section 7.8 when no heading is available.

3.2.9 DATA SOURCE – PRESSURE ALTITUDE SOURCE INOPERATIVE OR CONNECTION TO GTN LOST MESSAGE

Without a barometric altitude source to the GTN, the following features will not operate:

- Automatic leg sequencing of legs requiring an altitude source. The flight crew must manually sequence altitude legs, as prompted by the system.

3.2.10 UNRECOVERABLE LOSS OF ALL ELECTRICAL GENERATORS OR ALTERNATORS

Remove power from all equipment which is not necessary for flight, including GTN #2 if installed.

Section 4. NORMAL PROCEDURES

Refer to the Cockpit Reference Guide defined in Section 2.1 of this document or the Pilot's Guide defined in Section 7.1 for normal operating procedures and a complete list of system messages and associated flight crew actions. This includes all GPS operations, VHF communication and navigation, traffic, data linked weather, StormScope®, TAWS, and Multi-Function Display information.

The GTN requires a reasonable degree of familiarity to avoid becoming too engrossed at the expense of basic instrument flying in IMC and basic see-and-avoid in VMC. Garmin provides training tools with the Pilot's Guide and PC based simulator. Pilots should take full advantage of these training tools to enhance system familiarization.

4.1 Unit Power On

Database ..... **REVIEW EFFECTIVE DATES**
Self Test ..... **VERIFY OUTPUTS TO NAV INDICATORS**
Self Test - TAWS Remote Annunciator:
- PULL UP ..... **ILLUMINATED**
- TERR ..... **ILLUMINATED**
- TERR N/A ..... **ILLUMINATED**
- TERR INHB ..... **ILLUMINATED**

Self Test - GPS Remote Annunciator:
- VLOC ..... **ILLUMINATED**
- GPS ..... **ILLUMINATED**
- LOI or INTG ..... **ILLUMINATED**
- TERM ..... **ILLUMINATED**
- WPT ..... **ILLUMINATED**
- APR ..... **ILLUMINATED**
- MSG ..... **ILLUMINATED**
- SUSP or OBS ..... **ILLUMINATED**

Telephone Audio, if equipped:
Pilot, Co-pilot, Passenger ..... **DEACTIVATED**

4.2 Before Takeoff

System Messages and Annunciators ..... **CONSIDERED**

4.3 HSI and EHSI Operation

If an HSI is used to display navigation data from the GTN the pilot should rotate the course pointer as prompted on the GTN.

If an EHSI is used to display navigation data from the GTN the course pointer may autoslew to the correct course when using GPS navigation. When using VLOC navigation the course pointer will not autoslew and must be rotated to the correct course by the pilot. For detailed information about the functionality of the EHSI system, refer to the FAA approved Flight Manual or Flight Manual Supplement for that system.

CAUTION

The pilot must verify the active course and waypoint for each flight plan leg. The pilot must verify proper course selection each time the CDI source is changed from GPS to VLOC.

4.4 Autopilot Operation

The GTN may be coupled to an optional autopilot, if installed in the aircraft, when operating as prescribed in the LIMITATIONS section of this manual.

Autopilots coupled to the GTN system in an analog (NAV) mode will follow GPS or VHF navigation guidance as they would with existing VOR receivers.

Autopilots that support GPSS or GPS Roll Steering in addition to the analog course guidance will lead course changes, fly arcing procedures, procedure turns, and holding patterns if coupled in GPSS mode.

CAUTION

The GTN cannot provide course deviation to the autopilot for heading legs. Some autopilots do not allow the use of GPSS when course deviation is not provided.

For autopilot operating instructions, refer to the FAA approved Flight Manual or Flight Manual Supplement for the autopilot.

4.5 Coupling the Autopilot during approaches

CAUTION

When the CDI source is changed on the GTN, autopilot mode may change. Confirm autopilot mode selection after CDI source change on the GTN. Refer to the FAA approved Flight Manual or Flight Manual Supplement for the autopilot.

Analog only autopilots should use APR mode for coupling to LNAV approaches. Autopilots which support digital roll steering commands (GPSS) may utilize NAV mode and take advantage of the digital tracking during LNAV only approaches.

☐ This installation prompts the flight crew and requires the pilot to enable the approach outputs just prior to engaging the autopilot in APR mode.

To couple an approach:
Once established on the final approach course with the final approach fix as the active waypoint, the GTN will issue a flashing message indication.

Flashing Message Button ..... **PRESS**
"Enable APR Output" Button ..... **PRESS**

If coupled, Autopilot will revert to ROL mode at this time.

Autopilot ..... **ENGAGE APPROACH MODE**

☐ This installation supports coupling to the autopilot in approach mode once vertical guidance is available.

To couple an approach:
Once established on the final approach course with the final approach fix as the active waypoint, the GTN will enable vertical guidance.

Vertical Guidance ..... **CONFIRM AVAILABLE**
Autopilot ..... **ENGAGE APPROACH MODE**

☐ The installation *does not* support any vertical capture or vertical tracking.

4.6 Telephone & SMS Text (Optional)

Audio from the GSR 56 Iridium datalink is routed through your aircraft's audio panel Audio from the GSR 56 must be deactivated (turned off) unless making a phone call. The primary indication of an incoming phone call or SMS text are the visual indications on the GTN.

Section 5. PERFORMANCE

No change.

Section 6. WEIGHT AND BALANCE

See current weight and balance data.

7.1 Pilot's Guide

The Garmin GTN 6XX or GTN 7XX Pilot's Guide, part number and revision listed below, contain additional information regarding GTN system description, control and function. The Pilot's Guides *do not* need to be immediately available to the flight crew.

- GTN 6XX Pilot's Guide — P/N 190-01004-03 Rev C or later
- GTN 7XX Pilot's Guide — P/N 190-01007-03 Rev C or later

7.2 Leg Sequencing

The GTN supports all ARINC 424 leg types. Certain leg types require altitude input in order to sequence (course to altitude, for example). If a barometric corrected altitude source is not interfaced to the GTN, a popup will appear prompting the flight crew to manually sequence the leg once the altitude prescribed in the procedure is reached.

☐ This installation *has* a barometric corrected altitude source. The GTN will automatically sequence altitude legs.

☐ This installation *does not have* a barometric corrected altitude source. The flight crew will be prompted to manually sequence altitude legs.

7.3 Auto ILS CDI Capture

Auto ILS CDI Capture will not automatically switch from GPS to VLOC for LOC-BC or VOR approaches.

7.4 Activate GPS Missed Approach

☐ This installation *will* autoswitch from VLOC to GPS when the "Activate GPS Missed Approach" button is pressed.

☐ This installation *will not* autoswitch from VLOC to GPS when the "Activate GPS Missed Approach" button is pressed. The pilot must manually switch from VLOC to GPS if GPS guidance is desired after the missed approach point.

7.5 Terrain Proximity and TAWS

- The Obstacle Database has an area of coverage that includes the United States and Europe, and is updated as frequently as every 56 days.
- To avoid unwanted alerts, TAWS may be inhibited when landing at an airport that is not included in the airport database.

NOTE

The area of coverage may be modified as additional terrain data sources become available.

☐ This installation supports *Terrain Proximity. No aural or visual alerts* for terrain or obstacles are provided. Terrain Proximity *does not* satisfy the TAWS requirement of 91.223.

☐ This installation supports *TAWS B.* Aural and visual alerts *will be* provided. This installation *does* support the TAWS requirement of 91.223.

7.6 GMA 35 Audio Panel (Optional)

The GTN 725 and 750 can interface to a GMA 35 remotely mounted audio panel and marker beacon receiver. Controls for listening to various radios, activating the cabin speaker, clearance playback control, and marker beacon are accessed by pressing the "Audio Panel" button on the GTN display screen. Volume controls for the audio panel are accessed by pressing the "Intercom" button on the GTN display screen.

7.7 Traffic System (Optional)

This system is configured for the following type of traffic system. The Garmin GTN 6XX or GTN 7XX Cockpit Reference Guide or Garmin GTN 6XX or GTN 7XX Pilot's Guide provides additional information regarding the functionality of the traffic device.

☐ No traffic system is interfaced to the GTN.

☐ A TAS/TCAS I traffic system is interfaced to the GTN.

☐ A TIS traffic system is interfaced to the GTN.

☐ A TCAD traffic system is interfaced to the GTN.

☐ A Garmin GDL 88 ADS-B traffic system is interfaced to the GTN.

☐ A Garmin GDL 88 ADS-B traffic system is interfaced to the GTN. The GDL 88 ADS-B traffic system is also interfaced to an on board traffic system.

7.8 StormScope® (Optional)

When optionally interfaced to a StormScope® weather detection system, the GTN may be used to display the StormScope® information. Weather information supplied by the StormScope® will be displayed on the StormScope® page of the GTN system. For detailed information about the capabilities and limitations of the StormScope® system, refer to the documentation provided with that system.

Heading Up mode:

If the GTN system is receiving valid heading information, the StormScope® page will operate in the heading up mode as indicated by the label "HDG UP" presented at the upper right corner of the display. In this mode, information provided by the StormScope® system is displayed relative to the nose of the aircraft and *is* automatically rotated to the correct relative position as the aircraft turns.

Heading Not Available mode:

If the GTN system is not receiving valid heading information, either because a compatible heading system is not installed, or the interfaced heading system has malfunctioned, the StormScope® page will continue to operate without a heading source and indicate "HDG N/A" in the upper right corner of the GTN display. In this mode, information provided by the StormScope® system is displayed relative to the nose of the aircraft but *is not* automatically rotated to the correct relative position as the aircraft turns. When operating in this mode, StormScope® strikes must be cleared after each turn the aircraft performs.

7.9 Power

- Power to the GTN is provided through a circuit breaker labeled NAV/GPS (1/2).
- Power to the optional GTN COM is provided through a circuit breaker labeled COMM (1/2)
- Power to the optional GMA 35 is powered through a circuit breaker labeled AUDIO.

7.10 Databases

Database versions and effective dates are displayed on the start-up page immediately after power-on. Database information can also be viewed on the System – System Status page.

The Obstacle Database coverage area includes the United States and Europe.

7.11 External Switches

External switches may be installed and interfaced to the GTN. These switches may be stand alone, or integrated with a TAWS or GPS annunciator. Table 4 lists the switches and function they perform:

Switch Label	Function
CDI	Toggles between GPS / VLOC sources. This switch may be part of an external annunciator panel.
COM CHAN DN	Toggles down through the preset com frequencies.
COM CHAN UP	Toggles up through the preset com frequencies.
COM RMT XFR	Transfers the com active / standby frequencies.
NAV RMT XFR	Transfers the nav active / standby frequencies.
OBS	Performs an OBS or SUSP function. This switch is part of an external annunciator panel and is placarded with the following: "Green OBS indicates OBS or SUSP mode – GTN annunciator bar indicates which is active. Push OBS button to change OBS or SUSP mode."
OBS/SUSP	Performs an OBS or SUSP function.
TERR INHB	Toggles the TAWS Inhibit function on/off. This switch is part of an external annunciator panel. The terrain display is still presented if TAWS is Inhibited.

Table 4 – External Switches

7.12 Airspace Depiction and Alerts

The GTN aides the flight crew in avoiding certain airspaces with Smart Airspace and airspace alerts. Smart Airspace de-emphasizes depicted airspace that is not near the aircraft's current altitude. Airspace Alerts provide a message indication to the flight crew when the aircraft's current ground track will intercept an airspace type that has been selected for alerting.

NOTE

Smart Airspace and Airspace Alerts are separate features. Turning on/off Smart Airspace does not affect Airspace Alerts, and vice versa.

7.13 GDL 88 ADS-B Traffic System Interface (Optional)

The GDL 88 is an ADS-B traffic system that can interface to the GTN. The *nose* of the ownship symbol on both the GTN main map page and dedicated traffic page serves as the actual location of your aircraft. The *center* of the traffic target icon serves as the reported location for the target aircraft. Motion vectors for traffic may be displayed in either absolute or relative motion. The location of the traffic targets relative to the ownship are the same, regardless of the selected motion vector.

Absolute motion vectors are colored either cyan or white, depending on unit configuration. Absolute motion vectors depict the reported track of the traffic target referenced to the ground. An absolute motion vector pointed towards your ownship symbol *does not* necessarily mean the traffic target is getting closer to your aircraft.

Relative motion vectors are always colored green and depict the motion of the traffic target relative to your ownship symbol. The direction the traffic target is pointed may vary greatly from the motion vector and a target may be getting closer to your aircraft independent of the direction the target is pointed. A green relative motion vector pointed towards your ownship indicates that the traffic target *is* converging on your aircraft.

If more than one target is occupying the same area of the screen, the GTN will combine the two or more traffic targets into one traffic group. The presence of an asterisk to the left of a target indicates that traffic has been grouped. The highest priority traffic target in the group is displayed to the pilot. When applied to airborne targets the asterisk will be displayed in white or cyan depending on the traffic depiction color used in the installation. The asterisk will be brown for grouped ground targets. The asterisk will not turn amber, even if an alerted target is included in the group.

An alerted target may be placed in the same group as non-alerted targets. In this case, the alerted target will be displayed. Two alerted targets will not be placed in the same group. All alerted targets will be displayed on the screen.

Traffic targets displayed on the dedicated traffic page may be selected in order to obtain additional information about a traffic target or to view all targets in a grouped target. When a grouped target is selected, the "Next" button on the dedicated traffic page will cycle through all targets located in close proximity to where the screen has been touched.

7.14 GWX 70 Weather Radar (Optional)

The GWX 70 Weather Radar uses Doppler technology to provide advanced features to the flight crew such as turbulence detection and ground clutter suppression. These features that rely on Doppler technology are only supported by GWX 70 units that have a 12 inch antenna or lager. Turbulence detection is only supported at display ranges 40-160 nautical miles.

NOTE

Turbulence detection does not detect all turbulence, especially that which is occurring in clear air. The display of turbulence indicates the possibility of Severe or greater turbulence, as defined in the Aeronautical Information Manual.

7.15 Charts (Optional)

The GTN 750/725 can display both procedure charts and weather data on the main map page at the same time. When datalinked Nexrad or Precipitation is overlaid on the main map page, the weather data is displayed *below* an overlaid procedure chart. When airborne weather radar is overlaid on the main map page, the radar data is displayed *above* an overlaid procedure chart.

7.16 Transponder Control (Optional)

The GTN can be interfaced to a Garmin transponder for control and display of squawk code, mode, and additional transponder functions. The activation of the "Enable ES" button on the transponder page does not indicate the aircraft is in full compliance with an ADS-B Out solution in accordance with TSO-C166b (1090ES). Consult your transponder documentation for additional information.

OPERATING INSTRUCTIONS

Features

1. Instruments:

The Electronics International line of single and multi-channel instruments offer the following features:

A. Digital Display - The digital display allows you to read absolute temperatures at a glance. It does not require interpretation of dials or tic marks. In a short period of time you will be come familiar with the normal operating temperatures of your engine. Abnormal temperatures will be easy to spot. The digital display is easily viewable in direct sunlight. If the instrument backlight has been permanently powered up (as recommended), the digital display will be easier to see during low ambient light conditions and at night.

B. 1 Degree Resolution - The digital display resolves temperatures to 1 degree. This allows you to interpret trends quickly. This can be very helpful in diagnosing problems and leaning your engine. Also, any unit may be ordered to display in degrees F or degrees C.

C. 1/2% Accuracy - Electronics International instruments are not affected by shake, shock, vibration, tilt, stick-slip, bearing wear, spring wear, lead resistance, probe resistance, magnetic fields or the many other factors that plague analog instrument accuracy. All E.I. instruments are temperature compensated to read cabin temperature when a probe is disconnected. E.I. instruments should never need recalibration. **Carburetor and outside air temperatures are measured on precision channels. If a non-precision channel (i.e., EGT, CHT, etc.) is used to measure Carb. Temp or OAT there can be a several degree temperature error.** A precision channel uses a single yellow connector.

D. Flexibility - Electronics International instruments are compatible with any type K ungrounded probe. This means any instrument, regardless of what is printed on the front panel (EGT, CHT, OAT, etc.), will work with any of our probes (i.e., an OAT channel can read EGT or CHT probes accurately). Also, lead resistance does not affect the accuracy of these units. You may use any length extension cable between the unit and the probe without affecting the accuracy of the instrument.

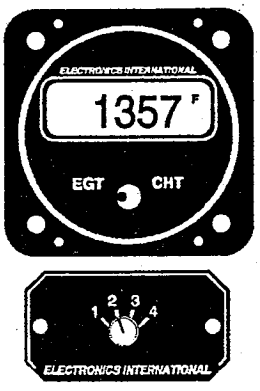
E. Upgradable - Any single channel EGT and/or CHT unit may be upgraded to a full multi-channel analyzer by simply adding a remote switch to the system. The instruments, remote switches, extension cables and probes were designed in a modular fashion with slip-on connectors. This means a remote switch may be added to your existing system by simply mounting it into your instrument panel, installing the additional wires and probes and plugging it in. You do not have to buy a new system to upgrade to a full analyzer.

Ice Zone Warning Light. Only available on the Carb. Temp/OAT instruments.

Digital Display.

Selector Switch.

2. Remote Switches:



Instrument displaying EGT for channel #2.

A remote switch may be connected to any channel on any Electronics International Instrument. This gives the instrument multi-channel capability. There are two types of remote switches available, single deck and double deck. If a single deck four channel remote switch (RS-4-1) is connected to the EGT channel on an EC-1, the instrument would be capable of measuring four EGT's and one CHT. The remote switch will select which EGT channel would be displayed on the EC-1 instrument when the instruments selector switch is placed in the EGT position. If a double deck four channel remote switch (RS-4-2) is connected to the EGT and CHT channels on an EC-1, the instrument will be capable of measuring four EGT's and four CHT's. The EC-1 will select wether EGT or CHT will be displayed. The Remote Switch will select which channel will be displayed.

EGT's

1. Leaning:

You will want to lean your engine in cruise. A rich running engine wastes fuel needlessly and tends to run rough. This creates vibration, which causes deterioration of engine accessories and engine mounts. Also, proper leaning at cruise and during descent means less spark plug fouling, longer life for the plugs, reduced maintenance costs and considerable fuel savings. Furthermore, good leaning techniques result in cleaner combustion chambers with fewer lead salt deposits on the pistons and exhaust valves. Under certain conditions, these deposits invite preignition and higher maintenance costs. Proper leaning at cruise during cool or cold weather aids in raising engine and oil temperatures to desirable minimums in order to evaporate the water and acids out of the oil. Water and acids attack the insides of an engine, causing rust and corrosion.

To properly lean your engine **using a multi-channel analyzer** perform the following steps:

A. Rough Leaning: Select the hottest EGT cylinder. Adjust the mixture control from the full rich position to a leaner setting that results in a slight drop in engine RPM or to a setting near peak EGT, as dictated by experience. The mixture control should be left at this setting until the EGT's stabilize. It will take about 20 seconds for the temperatures to stabilize within 1`F. This lag is due to the combustion walls and piston domes increasing in temperature, which affect the combustion and exhaust gas temperatures. **To correctly lean an engine you must wait for the engine to thermally stabilize.** Less sensitive gauges will not pick up these subtle changes, which are important in leaning and diagnosing problems.

B. Precision Leaning: Again select the hottest EGT cylinder. This cylinder may be different than the one you started with. This is the cylinder on which you should perform your precision leaning. Again, start leaning, making only very small adjustments and waiting 3 to 5 seconds between adjustments. As

you approach peak, the exhaust gas temperature will rise much slower until it starts to decrease. When this happens you have reached peak EGT. The 1`F resolution of the digital display will be invaluable in helping you precisely detect peak EGT.

C. Finding The Cylinder That Peaks First: For most engines Step B (Precision Leaning) will result in a properly leaned engine. If you find this to be the case with your engine, this step will not be necessary. But if you want to verify that you have leaned to the cylinder that peaked first and your engine is operating properly, perform the following with the cylinder found in step B at peak EGT. Slightly enrich the mixture and quickly step through each cylinder. Any cylinder that shows a rising temperature is a leaner cylinder. Check that this cylinder does not rise more than 15'F before it starts decreasing in temperature. If a cylinder rises more than 15'F it may have a problem.

When installing a single channel EGT instrument in an aircraft there is no guarantee that the probe is installed on the leanest cylinder. Every engine operates a little differently. For the same make and model of engine installed in the same type of aircraft there can be differences between the leanest cylinders. Furthermore, there can be a difference between operating temperatures and the temperature spread between cylinders. Every engine has its own unique operating temperatures. To properly lean your engine **using a single channel EGT unit** perform the following steps:

A. Rough Leaning: Adjust the mixture control from the full rich position to a leaner setting that results in a slight drop in engine RPM or to a setting near peak EGT, as dictated by experience. The mixture control should be left at this setting until the EGT's stabilize. It will take about 20 seconds for the temperatures to stabilize within 1`F. This lag is due to the combustion walls and piston domes increasing in temperature and, therefore, affecting the combustion and exhaust gas temperatures. **To correctly lean an engine you must wait for the engine to thermally stabilize**. Less sensitive gauges will not pick up these subtle changes, which are important in leaning and diagnosing problems.

B. Precision Leaning: Again, start leaning, making only very small adjustments and waiting 3 to 5 seconds between adjustments. As you approach peak the exhaust gas temperature will rise much slower until it starts to decrease. When this happens you have reached peak EGT. The 1`F resolution of the digital display will be invaluable in helping you precisely detect peak EGT. You will then need to enrichen the mixture for an EGT reading 30 'F lower than peak to insure there is no cylinder operating on the lean side of peak EGT.

If your engine runs rough before peak EGT is reached, note the temperature reading on the EGT instrument. When an engine starts to run rough (not when it loses power, but actually runs rough) the leanest cylinder has gone past peak EGT by 30 to 50 degrees F. The leanest cylinder is lean misfiring causing the engine to run rough. From this point enrichen the mixture to obtain a 50 degrees F lower EGT from the noted temperature. This will set the leanest cylinder slightly on the rich side of peak EGT. The rest of the cylinders will be running richer than the leanest by an amount dictated by the temperature spread for your engine. With this method you can reasonably lean an engine even when the probe has not been mounted on the leanest cylinder.

Electronics International's unique stable display allows you to precisely lean to peak EGT or to a specific temperature below peak for most engines. Peak EGT with a float-type carbureted engine is frequently a vague point because of the fuel/air distribution issues in these lower horsepower engines. As a result, these

engines tend to operate smoother at 25'F on the rich side of peak EGT. Fuel-injected engines will provide a more precise peak. Most engines normally operate within an EGT range of 1300'F to 1600'F at cruise power.

Some engine manufacturers allow leaning to peak EGT at 75% power and below on their direct drive normally aspirated engines. **For your engine, check the engine manufacturer's recommended procedures. It is not recommended to lean to peak EGT above 75% power settings.** The richer mixture is needed to cool the combustion temperatures and keep the anti-knock capability of the fuel high enough to prevent detonation from occurring at the higher power settings.

2. EGT Diagnostics:

Since the EGT is directly related to the combustion temperature, it is an indication of the engine's ability to produce power. If the engine is not producing the correct amount of power, the EGT instrument can be a very valuable troubleshooting tool as well an early warning system before engine failure occurs. With 1'F resolution, our digital EGT instruments will react to the slightest changes in the combustion process. To detect a problem, become familiar with your engine's normal EGT readings during run-up, climb, cruise and descent. Any difference from the norm can be a sign of trouble.

During normal operation the EGT will stabilize to 1'F for a given throttle and mixture setting. If it does not stabilize, this can also be the first sign of trouble. With rate and trend information being displayed instantaneously and with temperatures being read to 1'F, few problems can escape the pilot flying one of Electronics International's analyzer systems. The following is a list of EGT/CHT symptoms and possible problems:

Symptom		Possible Problem
One EGT reads abnormally high. The corresponding CHT reads lower than normal.	—	Burned valve or broken ring, defective plug, plug wire or mag.
One EGT reads abnormally high. The corresponding CHT reads higher than normal.	—	Plugged injector, intake leak.
One EGT reads abnormally low.	—	Over-sized injector, restricted exhaust, broken or leaky exhaust header.
High CHT's and/or high EGT's on all cylinders.	—	Excessive leaning with power settings over 75%. Detonation due to bad fuel. Closed or restricted cowl flaps. Missing or loose baffling.
High EGT's and/or low CHT's on all channels.	—	Timing problem or defective mag.
Jumpy readings on one channel.	—	This is not an engine problem. Check all connections and the probe for proper operation. See Troubleshooting Section of this manual.

It is not necessary to continually monitor the EGT's in order to detect a problem. Most problems worsen over a period of time and can be easily detected before they become a safety hazard by thoroughly checking the EGT readings at run-up and once or twice during a flight.

CHT's

1. CHT Operation:

The Cylinder Head Temperature (CHT) instrument helps the pilot protect his engine against the threat of excessive heat. Most general aviation aircraft monitor the hottest CHT, as determined by extensive flight tests done by the airframe manufacture. Minimum in-flight CHT should be 150'F, and maximum in most direct drive normally aspirated Avco Lycoming engines is 500'F. Some of the higher powered, more complex engines have a limit of 475'F. Although these are minimum and maximum limits, the pilot should operate the engine at more reasonable temperatures in order to achieve the expected overhaul life of the powerplant. It would be normal during all-year operations in climb and cruise to see cylinder head temperatures in the range of 350'F to 435'F.

Sudden cooling of the CHT (known as shock cooling) is a problem that is common with aircraft engines. This is caused by fast descents with little or no power and rich mixtures. This may result in bent pushrods due to exhaust valves sticking, burned valves, spark plug fouling, broken piston rings, cracked cylinders at the spark plug and valve ports and warped exhaust valves. To avoid these problems, do not allow the CHT to cool more rapidly than 1'F every 3 seconds during in-flight operation. This can be easily detected with our 1'F digital display.

During climbs, the cylinder head temperatures will rise rapidly until the heat absorbed by the combustion walls is dissipated out the engine's cooling fins. At this point, the CHT will stabilize. Any change in throttle, mixture, cowl or airspeed will affect the CHT and the rate at which it will change. Since rate and trend information can be easily interpreted from our digital display, changing any one of these parameters to stabilize, slow or reduce the CHT is possible with almost immediate results. Our digital instrument takes the guesswork out of controlling your CHT.

2. CHT Diagnostics:

The source of heat in an engine is from the combustion of the fuel/air mixture producing temperatures of approximately 4000'F. Some of this heat energy goes into heating the cylinder heads through radiation and conduction. This heat is sinked away from the engine by the air flow over the cylinder heads. When the heat being generated in the cylinder heads equalizes with the heat being sinked away, the cylinder head temperature will stabilize. If a problem arises in the combustion chamber or in the ability of the cooling system to sink away heat, the CHT's will be affected. To detect a problem, become familiar with your engine's CHT operating temperatures during run-up, climb, cruise and descent. Any differences from normal can be a sign of trouble.

Continuous change in the CHT can also be a sign of trouble. Because of the large thermal mass of the engine, the CHT's change slowly after the initial climb. Any continuous change in one or all of the CHT's after this initial climb can be the sign of trouble. The rate and trend of this change can easily be detected with Electronics International's 1'F resolution digital display. This information allows the pilot to make changes in flight attitude or engine operation and see the effects almost instantaneously.

Carburetor Temperature

Venturi affect and atomization of fuel can cause temperatures in the carburetor to drop 30'F or more. When the atmospheric conditions are right for the aircrafts' current flight altitude (moderate to high humidity), the moisture in the carburetor venturi can freeze quickly. Within minutes ice can choke off the venturi and the engine will stop with little warning.

When Carb. Temp. is selected on the Electronics International Carb. Temp. instrument, the carburetor temperature is continuously monitored and the "Ice Zone" warning light over the display is activated for that channel. The "Ice Zone" warning light is only active for the channel selected. At 39'F (before ice can form in the venturi of the carburetor) the "Ice Zone" warning light will light up. When this happens, apply carburetor heat, making small adjustments to bring the carburetor temperature above 39'F, thereby avoiding any possible carburetor icing condition. An additional benefit of running carburetor temperatures 9'F above freezing is improved atomization of the fuel which results in fewer lead deposits, cleaner plugs and better economy. If the carburetor temperature is below 10'F the "Ice Zone" warning light will go off. Below 10'F there is not enough moisture in the air to form ice in the carburetor.

The "Ice Zone" warning light has the advantage of catching your attention without having to continuously monitor the unit. At night this light may be too bright. An LED Intensity Control Line is provided which may be connected to the aircraft panel rheostat. When the instrument panel lights are turned up the "Ice Zone" warning light will dim.

Monitoring carburetor temperature to 1'F can also help with hard to start engines. If the engine becomes flooded and fuel starts to drip from the carburetor, the unit will display a drop in carburetor temperature as the fuel starts to evaporate. If the engine backfires and a fire starts in the venturi, the unit will display a rapid rise in the carburetor temperature. The carburetor probe is rated for 700'F, so probe damage is not likely.

Outside Air Temperature

The Electronics International OAT instrument has three features that make it a valuable tool when measuring outside air temperatures. The first of these features is its superior accuracy and linearity over conventional gauges. Outside air temperatures have a big affect on your aircraft's ability to lift and on engine horse-power. Accurate OAT readings are essential if you are looking for maximum performance from your aircraft.

The second valuable feature is the instrument's ability to detect small temperature changes (1'F). This gives the pilot rate and trend information (in what direction and how fast the temperatures are changing) at a glance. This is valuable for detecting changing atmospheric conditions and avoiding thunderstorms and icing conditions. It can also help to find cooler flying conditions in warm weather.

The third feature is the instrument's Ice Zone Warning Light. This light will come on when the OAT drops to 39'F and stays above 10'F. This feature can be very useful to a pilot by warning him of the possibility of structural ice if weather conditions are right.

The Electronics International OAT instrument resolves outside air temperatures to 1'F and is very sensitive to air temperatures changes. For this reason, when the OAT probe is in still air and near a heat source, such as hot asphalt, a hangar heater, etc., the unit will read the actual temperature to which the probe is subjected. When the engine starts and there is a flow to air over the probe, the unit will read the air temperature accurately and display changes quickly.

INSTALLATION INSTRUCTIONS

1. Important Information and Initial Check Out:

A. The installer and aircraft owner must read the Warranty before starting the installation. There is information in the Warranty that may alter your decision to install this instrument. **If you do not accept the terms of the Warranty, do not install this instrument.**

B. If you are not an FAA Certified Aircraft Mechanic familiar with the issues of installing aircraft EGT, CHT, Carb Temp and/or OAT instruments, Do Not attempt to install this instrument. The installer should use current aircraft standards and practices to install this instrument (refer to AC 43.13).

C. Check that any necessary FAA Approvals (STC's, etc.) are available for your aircraft before starting the installation. STC's are located at the back of this manual.

D. Read the entire Installation Instructions and resolve any issues you may have before starting the installation. This may eliminate any delays once the installation is started.

E. THIS INSTALLATION MAY REQUIRE SOME PARTS UNIQUE TO YOUR AIRCRAFT THAT ARE NOT SUPPLIED IN THE KIT. Acquire all the parts necessary to install this instrument before starting the installation.

F. Check that the instrument make and model are correct before starting the installation.

G. Before starting the installation make sure the unit will fit in the location you intend to install it without obstructing the operation of any controls.

H. If this instrument is to replace an existing unit in the aircraft, it is the installer's responsibility to move or replace any existing instruments or components in accordance with FAA approved methods and procedures. The following Installation Instructions do not cover moving or the removal of any existing instruments or components.

2. CHT Probe Installation:

A single CHT probe should be placed on the hottest cylinder. In a 6-cylinder engine this would be one of the center cylinders. On a 4-cylinder engine this would be one of the back cylinders.

If a second CHT probe is to be installed it should be placed on one of the front unobstructed cylinders. This will allow the unit to detect shock-cooling.

Most engines have a port just below the lower spark plug for the CHT probe. **If your engine has a primary CHT probe in one of the cylinders, do not remove it.** Select another cylinder for your probe. If you're putting a CHT probe on every cylinder use our P-102 Gasket CHT Probe for secondary readings on your primary cylinder.

3. EGT Probe Installation:

A single EGT probe should be installed in the exhaust stack of the leanest cylinder. Each engine has its own characteristics and the leanest cylinder can be different from aircraft to aircraft. As a general rule, the leanest cylinder is one of the back cylinders on a carbureted engine and one of the center cylinders on a fuel-injected engine.

Look at each exhaust stack and determine the best location at which all of the EGT probes can be mounted at the same distance down from the exhaust ports. The ideal location is 1 1/2", but ease of installation should prevail. Drill a 13/64" diameter hole in each exhaust stack. Insert the probe and tighten the hose clamp. As the hose clamp is heated and cooled, it will become loose as it conforms to the exhaust stack. After the first 10 hours of operation, each hose clamp should be retightened.

IMPORTANT NOTE: For Cessna 210's or any aircraft using a slip joint in the exhaust system, install the EGT probes ABOVE OR BELOW THE SLIP JOINT. Installing a EGT probe in the slip joint can damage the probe.

4. Carb Temp Probe Installation:

Remove the threaded plug located in the carburetor housing just below the throttle valve. Install the Carburetor Temperature Probe in this hole using a lock washer. Care should be taken not to over-tighten the probe and strip the threads in the carburetor housing.

If your carburetor does not have a factory tapped hole, remove the carburetor from the engine. Drill out the lead plug located just below the throttle valve with a 7/32 drill and tap this hole with a 1/4 x 28 tap. Remove all burrs and metal shavings from the interior and exterior of the carburetor. Install the carburetor temperature probe as outlined above. Reinstall the carburetor on the engine.