Section 6
Weight and Balance

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Introduction

This section describes the procedure for establishing the basic empty weight and moment of the airplane. Sample forms are provided for reference. Procedures for calculating the weight and moment for various operations are also provided. A comprehensive list of all equipment available for this airplane is included at the back of this section.

It should be noted that specific information regarding the weight, arm, moment, and installed equipment for this airplane as delivered from the factory can only be found in the plastic envelope carried in the back of this handbook.

It is the responsibility of the pilot to ensure that the airplane is loaded properly.

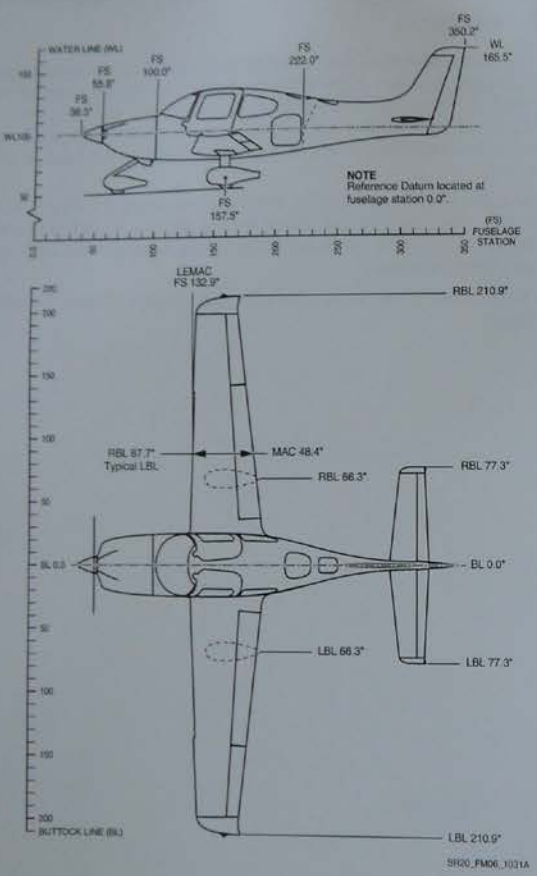
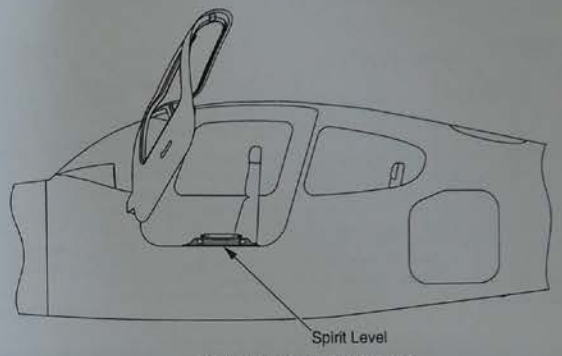
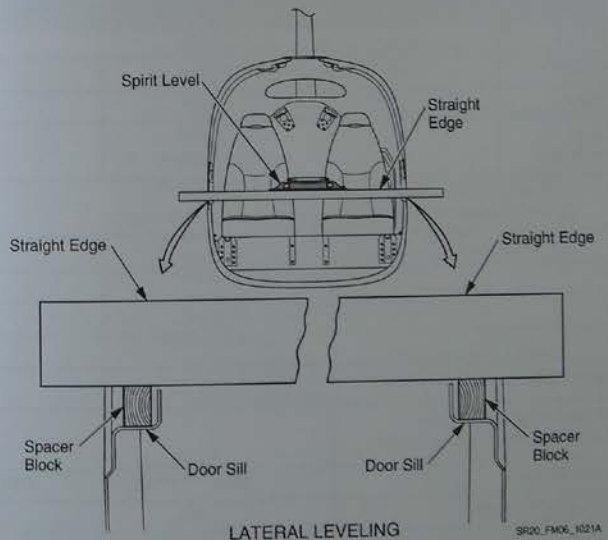


Figure 6-1
Airplane Dimensional Data



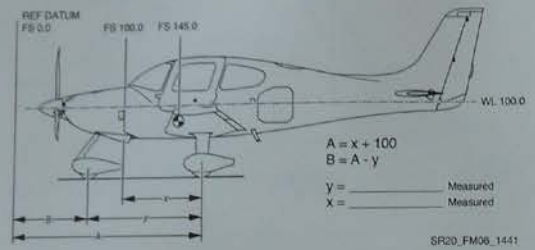
LONGITUDINAL LEVELING



LATERAL LEVELING

Figure 6-2
Airplane Leveling

Airplane Weighing Form



Weighing Point	Scale Reading	- Tare	= Net Weight	X Arm	= Moment
L Main				A=	
R Main				A=	
Nose				B=	
Total As Weighed				CG=	
CG = Total Moment / Total Weight *Space below provided for additions or subtractions to as weighed condition*					
Empty Weight				CG=	
Engine Oil (if oil drained) *15 lb at FS 78.4, moment = 1176*					
Unusable Fuel			26.4	153.95	4064
Basic Empty Weight				CG=	

Figure 6-3
Airplane Weighing Form

Airplane Weighing Procedures

A basic empty weight and center of gravity were established for this airplane when the airplane was weighed just prior to initial delivery. However, major modifications, loss of records, addition or relocation of equipment, accomplishment of service bulletins, and weight gain over time may require re-weighing to keep the basic empty weight and center of gravity current. The frequency of weighing is determined by the operator. All changes to the basic empty weight and center of gravity are the responsibility of the operator. *Refer to Section 8 for specific servicing procedures.*

1. Preparation:
   a. Inflate tires to recommended operating pressures.
   b. Service brake reservoir.
   c. Drain fuel system.
   d. Service engine oil.
   e. Move crew seats to the most forward position.
   f. Raise flaps to the fully retracted position.
   g. Place all control surfaces in neutral position.
   h. Verify equipment installation and location by comparison to equipment list.
2. Leveling (Figure 6-2):
   a. Level longitudinally with a spirit level placed on the pilot door sill and laterally with of a spirit level placed across the door sills. (See Figure 6-2) Alternately, level airplane by sighting the forward and aft tool holes along waterline 95.9.
   b. Place scales under each wheel (minimum scale capacity, 500 pounds nose, 1000 pounds each main).
   c. Deflate the nose tire and/or shim underneath scales as required to properly center the bubble in the level.
3. Weighing (Figure 6-3):
   a. With the airplane level, doors closed, and brakes released, record the weight shown on each scale. Deduct the tare, if any, from each reading.

4. Measuring (Figure 6-3):
   a. Obtain measurement 'x' by measuring horizontally along the airplane center line (BL 0) from a line stretched between the main wheel centers to a plumb bob dropped from the forward side of the firewall (FS 100). Add 100 to this measurement to obtain left and right weighing point arm (dimension 'A'). Typically, dimension 'A' will be in the neighborhood of 157.5.
   b. Obtain measurement 'y' by measuring horizontally and parallel to the airplane centerline (BL 0), from center of nosewheel axle, left side, to a plumb bob dropped from the line stretched between the main wheel centers. Repeat on right side and average the measurements. Subtract this measurement from dimension 'A' to obtain the nosewheel weighing point arm (dimension 'B').
5. Determine and record the moment for each of the main and nose gear weighing points using the following formula:

   Moment = Net Weight x Arm

6. Calculate and record the as-weighed weight and moment by totaling the appropriate columns.
7. Determine and record the as-weighed C.G. in inches aft of datum using the following formula:

   C.G. = Total Moment / Total Weight

8. Add or subtract any items not included in the as-weighed condition to determine the empty condition. Application of the above C.G. formula will determine the C.G. for this condition.
9. Add the correction for engine oil (15 lb at FS 78.4), if the airplane was weighed with oil drained. Add the correction for unusable fuel (26.4 lb at FS 153.95) to determine the Basic Empty Weight and Moment. Calculate and record the Basic Empty Weight C.G. by applying the above C.G. formula.
10. Record the new weight and C.G. values on the Weight and Balance Record.

The above procedure determines the airplane Basic Empty Weight, moment, and center of gravity in inches aft of datum. C.G. can also be expressed in terms of its location as a percentage of the airplane Mean Aerodynamic Cord (MAC) using the following formula:

C.G. % MAC = 100 x (C.G. Inches – LEMAC) / MAC

Where:

LEMAC = 132.9

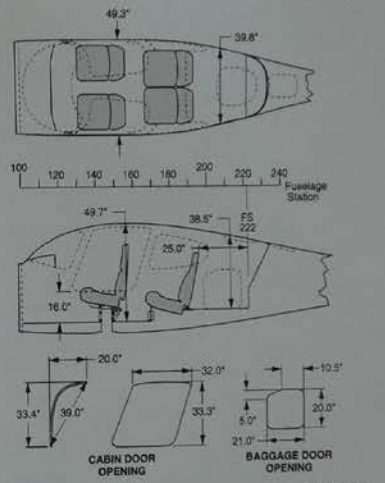
MAC = 48.4

Weight & Balance Record

Use this form to maintain a continuous history of changes and modifications to airplane structure or equipment affecting weight and balance:

Serial Num:			Reg. Num:					Page of	
Date	Item No.		Description of Article or Modification	Weight Change Added (+) or Removed (-)			Running Basic Empty Weight		
	In	Out		WT LB	ARM IN.	MOM/ 1000	WT LB	MOM/ 1000
			As Delivered					

Figure 6-4
Weight and Balance Record



Location	Length	Width	Height	Volume
Cabin	122"	49.3"	49.7	137 cu ft
Baggage Compartment	36"	39.8"	38.5"	32 cu ft

Figure 6-5
Airplane Interior Dimensions

Loading Instructions

It is the responsibility of the pilot to ensure that the airplane is properly loaded and operated within the prescribed weight and center of gravity limits. The following information enables the pilot to calculate the total weight and moment for the loading. The calculated moment is then compared to the Moment Limits chart or table for a determination of proper loading.

Airplane loading determinations are calculated using the Weight & Balance Loading Form (Figure 6-6), the Loading Data chart and table (Figure 6-7), and the Moment Limits chart and table (Figure 6-8).

1. **Basic Empty Weight** – Enter the current Basic Empty Weight and Moment from the Weight & Balance Record.
2. **Front Seat Occupants** – Enter the total weight and moment/1000 for the front seat occupants from the Loading Data.
3. **Rear Seat Occupants** – Enter the total weight and moment/1000 for the rear seat occupants from the Loading Data.
4. **Baggage** – Enter weight and moment for the baggage from the Loading Data.
   - If desired, subtotal the weights and moment/1000 from steps 1 through 4. This is the *Zero Fuel Condition*. It includes all useful load items excluding fuel.
5. **Fuel Loading** – Enter the weight and moment of usable fuel loaded on the airplane from the Loading Data.
   - Subtotal the weight and moment/1000. This is the *Ramp Condition* or the weight and moment of the aircraft before taxi.
6. **Fuel for start, taxi, and runup** – This value is pre-entered on the form. Normally, fuel used for start, taxi, and runup is approximately 6 pounds at an average moment/1000 of 0.92.
7. **Takeoff Condition** – Subtract the weight and moment/1000 for step 8 (start, taxi, and runup) from the Ramp Condition values (step 7) to determine the Takeoff Condition weight and moment/1000.
   - The total weight at takeoff must not exceed the maximum weight limit of 3000 pounds.

- The total moment/1000 must not be above the maximum or below the minimum moment/1000 for the *Takeoff Condition Weight* as determined from the Moment Limits chart or table.

Weight & Balance Loading Form

Serial Num: _____ Date: _____

Reg. Num: _____ Initials: _____

Item	Description	Weight LB	Moment/ 1000
1.	**Basic Empty Weight** *Includes unusable fuel & full oil*		
2.	Front Seat Occupants *Pilot & Passenger (total)*		
3.	Rear Seat Occupants		
4.	Baggage Area *130 lb maximum*		
5.	**Zero Fuel Condition Weight** *Sub total item 1 thru 4*		
6.	Fuel Loading *56 Gallon @ 6.0 lb/gal. Maximum*		
7.	**Ramp Condition Weight** *Sub total item 5 and 6*		
8.	Fuel for start, taxi, and runup *Normally 6 lb at average moment of 922.8*	–	–
9.	**Takeoff Condition Weight** *Subtract item 8 from item 7*		

* Note *

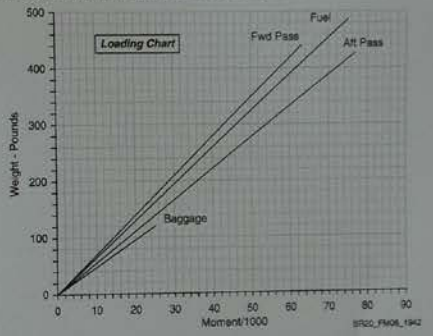
The Takeoff Condition Weight must not exceed 3000 lb. **All weights above 2900 lb must consist of fuel.**

The Takeoff Condition Moment must be within the Minimum Moment to Maximum Moment range at the Takeoff Condition Weight. (Refer to Figure 6-8, Moment Limits).

Figure 6-6
Weight and Balance Loading Form

Loading Data

Use the following chart or table to determine the moment/1000 for fuel and payload items to complete the Loading Form.



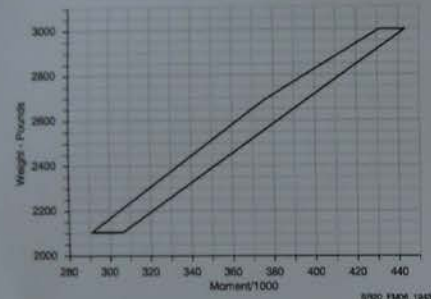
Weight LB	Fwd Pass FS 143.5	Aft Pass FS 180.0	Baggage FS 208.0	Fuel FS 153.8	Weight LB	Fwd Pass FS 143.5	Aft Pass FS 180.0	Fuel FS 153.8
20	2.87	3.60	4.16	3.08	220	31.57	39.60	33.83
40	5.74	7.20	8.32	6.15	240	34.44	43.20	36.90
60	8.61	10.80	12.48	9.23	260	37.31	46.80	39.98
80	11.48	14.40	16.64	12.30	280	40.18	50.40	43.05
100	14.35	18.00	20.80	15.38	300	43.05	54.00	46.13
120	17.22	21.60	24.96	18.45	320	45.92	57.60	49.20
140	20.09	25.20	(27.04)*	21.53	340	48.79	61.20	52.28
160	22.96	28.80		24.60	360	51.66	64.80	55.35
180	25.83	32.40		27.68	380	54.53	68.40	
200	28.70	36.00		30.75	400	57.40	72.00	

*130 lb Maximum

Figure 6-7
Loading Data

Moment Limits

Use the following chart or table to determine if the weight and moment from the completed Weight and Balance Loading Form are within limits.



SR20_FM06_1945A

Weight	Moment/1000		Weight	Moment/1000	
LB	Minimum	Maximum	LB	Minimum	Maximum
2110	293	305	2600	366	383
2150	299	311	2650	374	391
2200	306	320	2700	381	399
2250	314	328	2750	390	406
2300	321	336	2800	398	414
2350	329	344	2850	407	422
2400	336	352	2900	415	429
2450	344	360	2950	424	437
2500	351	368	3000	432	444
2550	359	376			

Figure 6-8
Moment Limits

Equipment List

This list will be determined after the final equipment has been installed in the aircraft.

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WEIGHT & BALANCE

PERFORMANCE

ABNORMAL

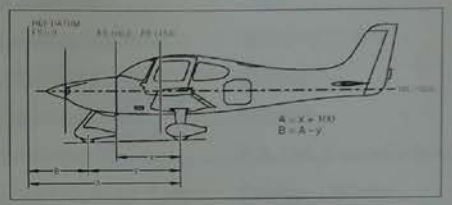
SYSTEMS DESCRIPTION

HANDLING, SERV & MAINT

SUPPLEMENTS

Cirrus Design Corporation
SR20 Weights, Balance, and Equipment List

Date:	8/19/2008
Registration Number:	~~N539PG~~ N775ST
Serial Number:	1989



WEIGHING POINT	Scale Reading	Tare	Net Weight	ARM	MOMENT
Left Main					
Right Main					
Nose Gear					
Empty Weight	0		2163.00	140.07	302982.000
				14.6%	
Space below is provided for additions or subtractions					
Install Tanis Heater			1.69	76.0	128.440
					0.000
					0.000
					0.000
					0.000
					0.000
					0.000
					0.000
Unusable Fuel					
			2164.69	140.0	303110.440
Basic Empty Weight			**2164.69**	**140.0**	**303.110**
			CG (%MAC)	**14.5%**	

Delivered Weight Data & Equipment List

Model SR20

Serial Number: 1989

Registration Number: ~~N530PG~~ 7789T

~~**Basic Empty Weight:** 2163 lb~~

~~**Total Moment/1000:** 302.982~~

SUPERCEDED 8/15/08

~~**Center of Gravity:** F.S 140.1 or 14.7 MAC~~

Parachute Canopy Color: Orange / White

The following pages list required, standard, and optional equipment, as well as gives the weight and arm of each listed item. This listing represents the airplane and all options available at the time of delivery and does not include any equipment installed after delivery.

Note:
Not all optional equipment in this listing was installed in the above serial number airplane. Equipment listed as optional but not installed in the airplane is indicated by a hyphen (-) in the quantity column for that piece of equipment.

ATA - Item:
Each item in the listing is provided a unique number. The first two digits of the number represent the ATA or GAMA Chapter reference number. These numbers are used industry wide and in the Cirrus Design SR20 Maintenance Documentation to locate items in the Maintenance Manuals and or Parts Catalogs. The two digits following the hyphen are sequence numbers for each item in that chapter.

Description:
This is the component, assembly, or installation name.

Sym:
Items in this listing are coded by a symbol indicating the status of the item. These codes are:
C Required item for FAA Certification.
S Standard equipment. Most standard equipment is applicable to all airplanes. Some equipment may be replaced by optional equipment.
O Optional equipment. Optional equipment may be installed in addition to or to replace standard equipment.

Qty:
The quantity of the listed item in the airplane. A hyphen (-) in this column indicates that the equipment was not installed

Part Number
This is the Cirrus Design Part Number for the component, assembly, or installation

Unit Wt
The weight, in pounds, of one each of the listed item.

Arm
The arm, in inches, of the listed item.

ATA / Item	Description	Sym	Qty	Part Number	Unit Wt	Arm
21	**Air Conditioning**					
21-01	Blower Fan	O	1	20970-001	7.3	133.0
22	**AutoFlight**					
22-01	System DFC 90 ~~55X~~ Autopilot Installation	O	1	13560-002	3.0	123.3
22-02	System 55SR Autopilot Installation	S	-	14778-005	3.0	123.3
23	**Communications**					
23-01	Radios, See 34 – Navigation	-	-	-	-	-

ATA / Item	Description	Sym	Qty	Part Number	Unit Wt	Arm
24	**Electrical Power**					
24-01	Alternator 1	C	1	50933-001	12.3	61.8
24-02	Alternator 2	C	1	19911-001	5.7	91.0
24-03	Battery 1	C	1	50366-001	28.0	96.0
24-04	Battery 2	C	1	15916-001	11.5	230.0
24-05	MCU	C	1	19900-001	9.8	98.0
25	**Equipment & Furnishings**					
25-01	ELT and Batteries	C	1	12756-050	3.6	228.8
25-02	Fwd Seat & Restraint Inst. (Leather: add 0.4 lb each)	C	2	20907-001/-002	27.0	149.3
25-03	Rear Seat Installation (Leather: add 0.4 lb each)	C	2	11933-003	21.8	180.0
25-04	Rear Seat Restraint	C	2	12491-001	2.3	180.0
26	**Fire Protection**					
26-01	Portable Fire Extinguisher	C	1	12533-003	1.5	118.4
27	**Flight Controls**					
27-01	Flap Actuator	C	1	11787-003	4.4	173.9
27-02	Roll Trim Cartridge Assy	C	1	15660-001	0.4	161.8
27-03	Roll Trim Motor Assembly	C	1	12546-003	1.3	159.8
27-04	Pitch Trim Cartridge Assy	C	1	15650-002	0.4	310.9
27-05	Pitch Tim Motor Assy	C	1	14832-001	1.3	303.5
27-06	Yaw Trim Cartridge Assy	C	1	11898-002	0.4	106.2
28	**Fuel**					
28-01	Fuel Quantity Indicator	C	1	12615-002	0.8	138.0
28-02	Fuel Selector Valve	C	1	17921-001	1.8	140.8
28-03	Gascolator	C	1	50199-001	1.0	98.5
31	**Indicating & Recording**					
31-01	Annunciator Panel	C	1	13567-001	0.3	117.2
31-02	Hourmeter (Ea)	S	2	50485-001	0.1	142.3
32	**Landing Gear**					
32-01	Main Gear Installation	C	2	14446-001/-002	34.0	157.5
32-02	Main Gear Pants (L/R)	C	2	15311-003/-004	4.1	157.5
32-03	Main Gear Fairings Instl	O	2	18143-001/-002	14.3	157.5
32-04	Brake Assembly (L/R)	C	2	13399-104	3.2	157.5
32-05	Main Wheels	C	2	13399-101	7.8	157.5
32-06	Main Tire	C	2	14075-006	6.3	157.5

ATA / Item	Description	Sym	Qty	Part Number	Unit Wt	Arm
32-07	Main Tube	C	2	14076-002	1.0	157.5
32-08	Nose Gear Installation	C	1	10784-002	32.0	86.0
32-09	Nose Wheel	C	1	12798-001	4.5	71.8
32-10	Nose Tire 5.00 x 5	C	1	14075-003	4.3	71.8
32-11	Nose Tire Tube	C	1	50073-065	1.0	71.8
32-12	Nose Gear Fairing & Pant	S	1	15564-001	0.9	78.0
32-13	Brake Master Cylinder	C	4	14269-001	0.6	104.5
32-14	Brake Fluid Reservoir	C	1	12006-001	0.4	98.1
33	**Lights**					
33-01	Strobe/Nav Lights (L/R)	C	2	17140-001	0.6	161.8
33-02	Strobe Power Supply (L/R)	C	2	14286-002	1.7	147.8
33-03	Landing Light Installation	S	I	20248-XXX	1.9	80.0
34	**Navigation & Pitot Static**					
34-01	Avidyne EX3000C MFD	O	-	17059-001	6.4	121.8
34-02	Avidyne EX5000C MFD	O	1	14750-006	6.4	121.8
34-03	Altimeter	C	1	12102-002	1.1	116.1
34-04	Airspeed Indicator	C	1	12105-001	0.7	116.9
34-05	Attitude Indicator	O	1	13459-002	2.2	114.5
34-06	Magnetic Compass	C	1	12451-002	0.3	132.7
34-07	Turn Coordinator	C	1	11891-001	1.8	118.0
34-08	GMA 340 Audio Panel	S	1	12717-050	1.5	121.5
34-09	Marker Beacon Antenna	S	1	12743-001	0.6	200.0
34-11	Transponder Antenna	S	1	12739-001	0.1	105.0
	PFD Option					
34-12	• Avidyne PFD	C	I	15222-XXX	12.0	115.5
	Navigator Option					
34-15	• GNC 420 (GPS/COM/NAV)	O	-	12718-081	5.0	121.0
34-16	• GNS 430 (GPS/COM/NAV) (Ea)	O	2	12718-071	5.0	121.0
34-18	• GPS 1 Antenna	C	1	12744-005	0.4	136.2
34-19	• GPS 2 Antenna	S	1	12744-004	0.4	110.3
34-20	• COM 1 Antenna	S	1	12740-001	0.5	178.5
34-21	• COM 2 Antenna	O	1	12741-001	0.5	204.6
34-22	• VOR/LOC Antenna	O	1	12742-001	0.4	331.0
	EMax Engine Monitoring					
34-23	• Data Acquisition Unit	O	1	16692-002	2.0	118.0

ATA / Item	Description	Sym	Qty	Part Number	Unit Wt	Arm
34-24	• Monitor Cabin Harness	O	1	16695-002	2.0	108.0
	Sky Watch Option					
34-26	• Sky Watch Antenna	O	1	14477-101	2.3	150.5
34-27	• Sky Watch Track Box	O	1	14477-051	10.0	140.0
	Stormscope Option					
34-28	• Processor	O	1	12745-050	1.7	199.0
34-29	• Antenna	O	1	12745-070	0.9	191.0
	Transponder Option					
34-29	• Mode A/C Transponder	O	1	13587-050	1.6	124.9
34-30	• Mode S Transponder	O	-	15966-050	2.6	121.0
	TAWS Option					
34-31	• KGP 560 Processor	O	1	15963-001	1.3	117.0
	XM Satellite Options					
34-32	• XM WX / Radio Receiver	O	1	17710-001	1.7	114.0
34-33	• XM Radio Remote Control	O	1	16665-502	0.2	149.3
61	**Propeller**					
61-01	Propeller Governor	C	1	15524-001	3.2	61.7
61-02	• 2-Blade Propeller Installation	C	-	BHC-J2YF-1BF/	58.0	51.6
61-03	• 3-Blade Propeller Installation	O	1	PHC-J3YF-1RF/	80.5	51.6
72	**Engine**					
72-01	Engine Installation	C	1	12010-XXX	379.0	76.5
72-01	Induction Filter	C	1	50207-001	0.4	62.9
73	**Engine Fuel**					
73-01	Fuel Pressure Switch Assy	C	1	13598-001	0.4	67.8
73-02	Auxiliary Fuel Pump	C	1	11839-001	3.2	97.1
78	**Engine Exhaust**					
78-01	Heater Muffler	C	1	20559-004	7.2	87.0
78-02	LH Muffler	C	1	20560-001	2.8	86.0
78-03	Tailpipe	C	2	20556-002	2.9	99.0
95	**Special Equipment**					
95-01	Packed Parachute (CAPS)	C	1	20331-001	54.0	235.5
95-02	Airplane Flight Manual	C	1	11934-003	3.1	160.5