KELLY AEROSPACE
Thermal Systems

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Revisions

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1 Background

This document describes Weight and Balance data for Kelly Aerospace, Thermal Systems Division (KATS) installation of an engine mounted alternator and associated circuitry and components that comprise an auxiliary aircraft power bus. This bus is dedicated to powering an electric air conditioning system.

1.1 Scope

This Weight and Balance Report is for the KATS air conditioning system designed for the PA 44 Piper Seminole aircraft. This document is an engineering level document, weight and balance information is also intended for use during STC installation.

1.2 Introduction

The KATS electric air conditioning system (trade name ThermaCool) is designed to provide comfortable cabin temperatures for small, general aviation aircraft. The air conditioning system operates from a DC power bus - either an aircraft power bus or a separate and independent DC power bus. When powered from the independent bus, the A/C system has a dedicated alternator, regulator and protective devices. This Weight and Balance Report considers the air conditioning system as implemented in the PA 44 Piper Seminole.

2 N297ND, S/N 4496078 PA-44-180 Weight and Balance

2.1 Aux Bus Kit KATS-11-002 Weight and Moment Arm

KATS-11-002 Weight = 53 pounds

KATS-11-002 Moment = 9462.6 inch-pounds

KATS-11-002 Center of Gravity from Datum = 178.54

2.2 Weight and Balance prior to Air Conditioning Kit KATS-11-002 Installation

Aircraft Make	Piper			
Aircraft Model	PA-44-180			
Serial Number	4496078			
Registration No	N297ND			
Datum	78.4 inches ahead of wing leading edge at WS106			
Item		**Weight**	**ARM**	**Moment**
	Nose	630.00	8.60	5418.00
	Left	1013.00	109.80	111227.40
	Right	1037.00	109.80	113862.60
	add oil for full, 2 qts per engine	7.50	51.30	384.75
				0.00
New Empty Weight		**2687.5**	**85.91**	**230892.8**

2.3 Weight and Balance after Air Conditioning Kit KATS-11-002 Installation

Aircraft Make	Piper			
Aircraft Model	PA-44-180			
Serial Number	4496078			
Registration No	**N297ND**			
Datum	78.4 inches ahead of wing leading edge at WS106			
Item		**Weight**	**ARM**	**Moment**
	Nose	594.00	8.60	5108.00
	Left	1070.00	109.80	117486.00
	Right	1069.00	109.80	117376.20
	add oil for full, 2 qts per engine	7.50	51.30	384.75
				0.00
New Empty Weight		**2740.5**	**87.70**	**240355.4**

3 Relevant Documents

3.1 Regulatory

3.1.1 § 23.23 Load distribution limits.

(a) Ranges of weights and centers of gravity within which the airplane may be safely operated must be established. If a weight and center of gravity combination is allowable only within certain lateral load distribution limits that could be inadvertently exceeded, these limits must be established for the corresponding weight and center of gravity combinations.

(b) The load distribution limits may not exceed any of the following:

(1) The selected limits;

(2) The limits at which the structure is proven; or

(3) The limits at which compliance with each applicable flight requirement of this subpart is shown.

3.1.2 § 23.25 Weight limits.

(a) *Maximum weight.* The maximum weight is the highest weight at which compliance with each applicable requirement of this part (other than those complied with at the design landing weight) is shown. The maximum weight must be established so that it is—

(1) Not more than the least of—

(i) The highest weight selected by the applicant; or

(ii) The design maximum weight, which is the highest weight at which compliance with each applicable structural loading condition of this part (other than those complied with at the design landing weight) is shown; or

(iii) The highest weight at which compliance with each applicable flight requirement is shown, and

(2) Not less than the weight with—

(i) Each seat occupied, assuming a weight of 170 pounds for each occupant for normal and commuter category airplanes, and 190 pounds for utility and acrobatic category airplanes, except that seats other than pilot seats may be placarded for a lesser weight; and

(A) Oil at full capacity, and

(B) At least enough fuel for maximum continuous power operation of at least 30 minutes for day-VFR approved airplanes and at least 45 minutes for night-VFR and IFR approved airplanes; or

(ii) The required minimum crew, and fuel and oil to full tank capacity.

(b) *Minimum weight.* The minimum weight (the lowest weight at which compliance with each applicable requirement of this part is shown) must be established so that it is not more than the sum of—

(1) The empty weight determined under §23.29;

(2) The weight of the required minimum crew (assuming a weight of 170 pounds for each crewmember); and

(3) The weight of—

(i) For turbojet powered airplanes, 5 percent of the total fuel capacity of that particular fuel tank arrangement under investigation, and

(ii) For other airplanes, the fuel necessary for one-half hour of operation at maximum continuous power.

3.1.3 § 23.29 Empty weight and corresponding center of gravity.

(a) The empty weight and corresponding center of gravity must be determined by weighing the airplane with—

(1) Fixed ballast;

(2) Unusable fuel determined under §23.959; and

(3) Full operating fluids, including—

(i) Oil;

(ii) Hydraulic fluid; and

(iii) Other fluids required for normal operation of airplane systems, except potable water, lavatory pre-charge water, and water intended for injection in the engines.

(b) The condition of the airplane at the time of determining empty weight must be one that is well defined and can be easily repeated.

3.1.4 § 23.1519 Weight and center of gravity.

The weight and center of gravity limitations determined under §23.23 must be established as operating limitations.

4 Weight and Balance Information

The auxiliary bus has the following weight and balance information

WEIGHT = 53 pounds

MOMENT ARM = 178.54 inches

5 Weight and Balance Envelope

The weight and moment arm for the Air Conditioning System and the Aux Bus install were inserted into the standard aircraft weight and balance information to ensure that the additional weight does not cause the aircraft to exceed its normal weight and balance envelope. The standard empty equipped weight and cg location for aircraft serial numbers 4496301, 4496300, 4496299, 4496298, 4496297 were used for these calculations. An average of 20.52 pounds of optional equipment is already included in these average numbers. An additional 25 pounds was included in these calculations below to produce a worst case scenario for optional equipment. Addition of the optional equipment does not put the aircraft outside the cg and weight envelopes. Conditions are listed below and were chose per FAR 23.25. There are no changes to the normal weight and balance envelope for the PA-44 due to the Air Conditioning System STC.

CASE 1 - FAR 23.25 (a) (1) (ii)	**WT**	**CG**	**Moment**
Average of Last 5 Aircraft Produced	2617.98	85.84	224726.9
Kelly AC	53	178.54	9462.62
Aux Bus	16	40.23	643.68
Pilot/coP	340	80.5	27370
Passengers	340	118.1	40154
Fuel	391.95	95	37235.25
Baggage	0	142.8	0
Opt Equipment	46.09	134.1395	6182.49
	3805.0	**90.9**	345775

Table 1 - CASE 1 - FAR 23.25 (a) (1) (ii)

CASE 2 - FAR 23.25 (a) (2) (ii)	WT	CG	Moment
Average of Last 5 Aircraft Produced	2617.98	85.84	224726.9
Kelly AC	53	178.54	9462.62
Aux Bus	16	40.23	643.68
Pilot/coP	170	80.5	13685
Passengers	0	118.1	0
Fuel	648	95	61560
Baggage	0	142.8	0
Opt Equipment	46.09	134.1395	6182.49
	3551.1	**89.1**	316260.7

Table 2 - CASE 2 - FAR 23.25 (a) (2) (ii)

CASE 3 - FAR 23.25 (a) (2) (i) (A) (B)	WT	CG	Moment
Average of Last 5 Aircraft Produced	2617.98	85.84	224726.9
Kelly AC	53	178.54	9462.62
Aux Bus	16	40.23	643.68
Pilot/coP	340	80.5	27370
Passengers	340	118.1	40154
Fuel	140.4	95	13338
Baggage	0	142.8	0
Opt Equipment	46.09	134.1395	6182.49
	3553.5	**90.58**	321877.7

Table 3 - CASE 3 - FAR 23.25 (a) (2) (i) (A) (B)

CASE 4 - FAR 23.25 (b) (2) (3) (ii)	WT	CG	Moment
Average of Last 5 Aircraft Produced	2617.98	85.84	224726.9
Kelly AC	53	178.54	9462.62
Aux Bus	16	40.23	643.68
Pilot/coP	170	80.5	13685
Passengers	0	118.1	0
Fuel	93.6	95	8892
Baggage	0	142.8	0
Opt Equipment	46.09	134.1395	6182.49
	2996.7	**88.0**	263592.7

Table 4 - CASE 4 - FAR 23.25 (b) (2) (3) (ii)

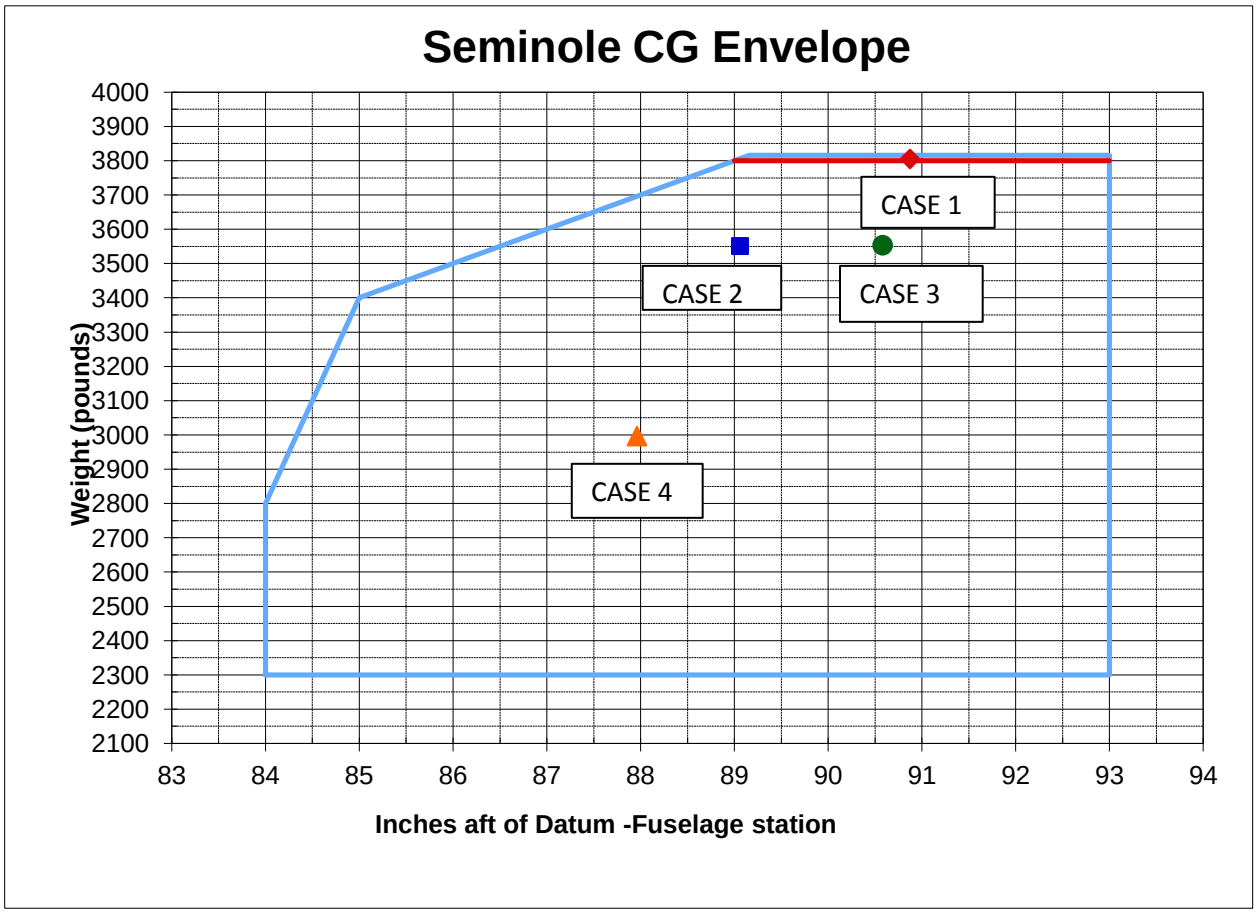

Figure 1 - PA-44 Weight and Balance Envelope with Aux Bus and Air Conditioning System