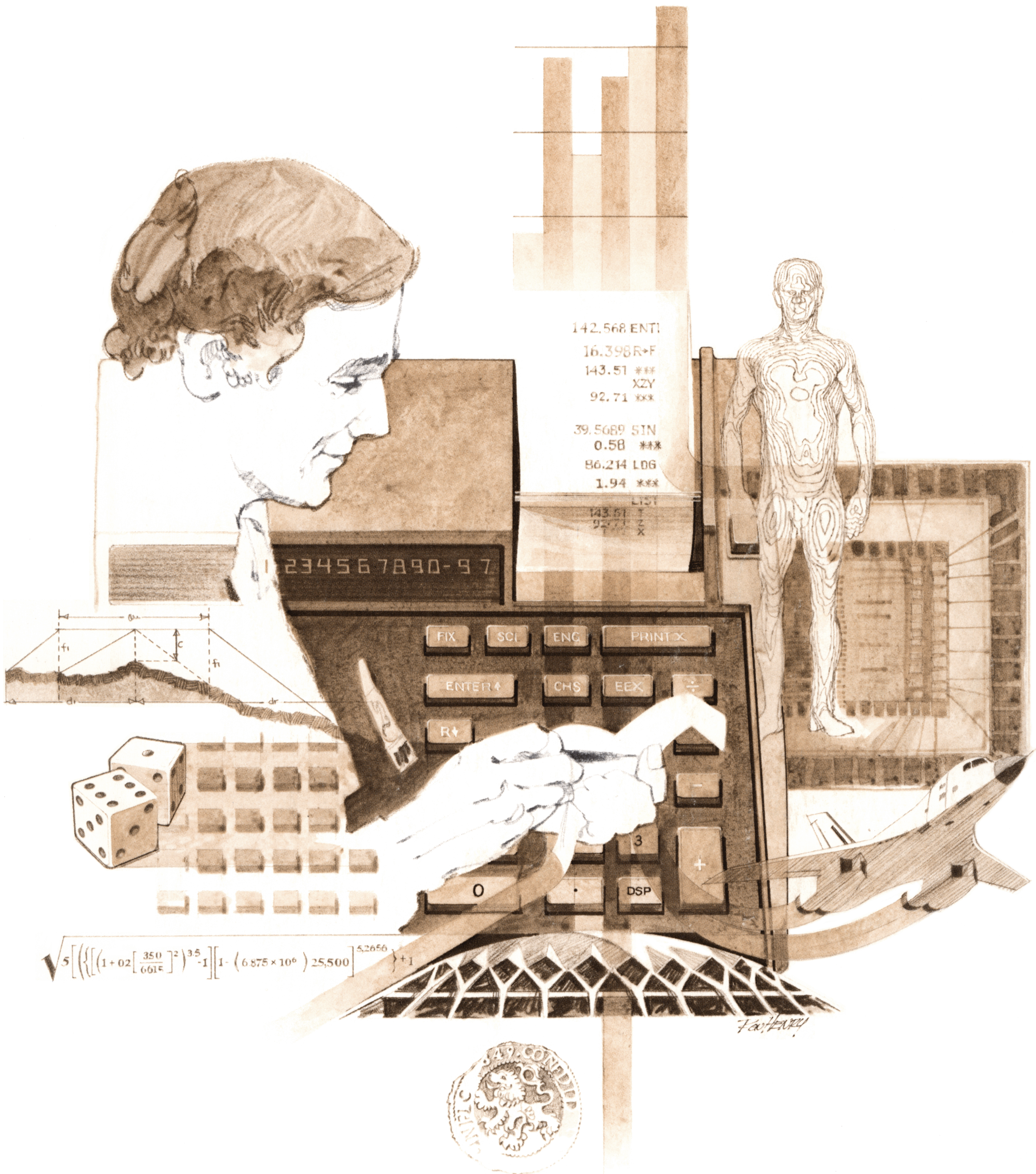
HEWLETT-PACKARD

HP-67/HP-97

Users' Library Solutions

Aircraft Operation



INTRODUCTION

In an effort to provide continued value to it's customers, Hewlett-Packard is introducing a unique service for the HP fully programmable calculator user. This service is designed to save you time and programming effort. As users are aware, Programmable Calculators are capable of delivering tremendous problem solving potential in terms of power and flexibility, but the real genie in the bottle is program solutions. HP's introduction of the first handheld programmable calculator in 1974 immediately led to a request for program **solutions** — hence the beginning of the HP-65 Users' Library. In order to save HP calculator customers time, users wrote their own programs and sent them to the Library for the benefit of other program users. In a short period of time over 5,000 programs were accepted and made available. This overwhelming response indicated the value of the program library and a Users' Library was then established for the HP-67/97 users.

To extend the value of the Users' Library, Hewlett-Packard is introducing a unique service—a service designed to save you time and money. The Users' Library has collected the best programs in the most popular categories from the HP-67/97 and HP-65 Libraries. These programs have been packaged into a series of low-cost books, resulting in substantial savings for our valued HP-67/97 users.

We feel this new software service will extend the capabilities of our programmable calculators and provide a great benefit to our HP-67/97 users.

A WORD ABOUT PROGRAM USAGE

Each program contained herein is reproduced on the standard forms used by the Users' Library. Magnetic cards are not included. The Program Description I page gives a basic description of the program. The Program Description II page provides a sample problem and the keystrokes used to solve it. The User Instructions page contains a description of the keystrokes used to solve problems in general and the options which are available to the user. The Program Listing I and Program Listing II pages list the program steps necessary to operate the calculator. The comments, listed next to the steps, describe the reason for a step or group of steps. Other pertinent information about data register contents, uses of labels and flags and the initial calculator status mode is also found on these pages. Following the directions in your HP-67 or HP-97 **Owners' Handbook and Programming Guide**, "Loading a Program" (page 134, HP-67; page 119, HP-97), key in the program from the Program Listing I and Program Listing II pages. A number at the top of the Program Listing indicates on which calculator the program was written (HP-67 or HP-97). If the calculator indicated differs from the calculator you will be using, consult Appendix E of your **Owner's Handbook** for the corresponding keycodes and keystrokes converting HP-67 to HP-97 keycodes and vice versa. No program conversion is necessary. The HP-67 and HP-97 are totally compatible, but some differences do occur in the keycodes used to represent some of the functions.

A program loaded into the HP-67 or HP-97 is not permanent—once the calculator is turned off, the program will not be retained. You can, however, permanently save any program by recording it on a blank magnetic card, several of which were provided in the Standard Pac that was shipped with your calculator. Consult your **Owner's Handbook** for full instructions. A few points to remember:

> The Set Status section indicates the status of flags, angular mode, and display setting. After keying in your program, review the status section and set the conditions as indicated before using or permanently recording the program.
>
> REMEMBER! To save the program permanently, **clip** the corners of the magnetic card once you have recorded the program. This simple step will protect the magnetic card and keep the program from being inadvertently erased.

As a part of HP's continuing effort to provide value to our customers, we hope you will enjoy our newest concept.

TABLE OF CONTENTS

Program Description I

Program Title Aircraft Flight Plan With Wind

Contributor's Name Hewlett-Packard

Address 1000 N.E. Circle Blvd.

City Corvallis **State** Oregon **Zip Code** 97330

Program Description, Equations, Variables

This program is used when making a flight plan which includes winds. It solves the wind triangle, giving correct values for magnetic heading and ground speed. It works for multiple leg lengths, computing time for each leg, cumulative time, and fuel consumed for each leg. The program corrects reported winds from true direction to magnetic direction before using them in a calculation. The winds, true airspeed, fuel consumption, and magnetic variation can be altered on each leg of the flight. The equations used to compute the heading (HDG) and ground speed (GS) of the aircraft are

$$HDG = C + \sin^{-1} \frac{W}{TAS} \sin (D - C)$$

$$GS = TAS \cos (HDG - C) - W \cos (D - C)$$

where W is wind velocity, D is wind direction (magnetic), C is the magnetic course and TAS is the true airspeed.

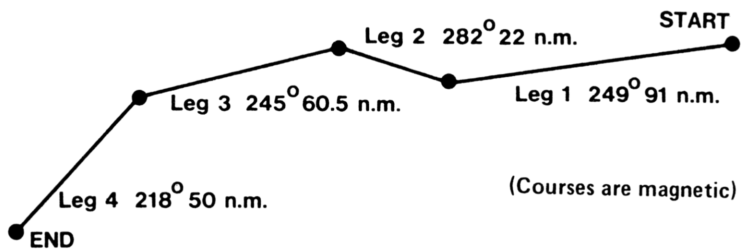
Operating Limits and Warnings

Wind must be less than 100 knots. Wind speed must not exceed true airspeed.

Program Description II

Sketch(es)

Sample Problem(s)



Winds for legs 1 and 2 — 230 degrees (true) @ 30 knots.
Winds for legs 3 and 4 — 300 degrees (true) @ 20 knots.
Fuel consumption 8 gal/hr, TAS 105, magnetic variation 15 degrees E.

Solution(s)

For the sketch above the following data table is completed (underlined values are input data).

Course/Steer	GS	Dist	Time/Total	Fuel
249/240	79	91	1:09:18/1:09:18	9.2
282/267	90	22	0:14:44/1:24:02	2.0
245/252	89	60.5	0:40:50/2:04:53	5.4
218/228	96	50	0:31:23/2:36:16	4.2

Reference(s)

This program is a direct translation of a program from the HP-65 Aviation Pac.

Program Description II

Sketch(es)

Sample Problem(s)

Solution(s)

Keystrokes	See Displayed
[f][E] 8 **A** 105 **A** 230.30 **B** 15 **B** 249 **C**	240
C	79
91 **D**	1.0918
D	1.0918
E	9.2
282 **C**	267
C	90
22 **D**	0.1444

Reference(s)

Program Description II

Sketch(es)

Sample Problem(s)

Solution(s)

$\boxed{D}$	1.2403
$\boxed{E}$	2.0
300.20 $\boxed{B}$ 245 $\boxed{C}$	252
$\boxed{C}$	89
60.5 $\boxed{D}$	0.4050
$\boxed{D}$	2.0453
$\boxed{E}$	5.4
218 $\boxed{C}$	228
$\boxed{C}$	96

Reference(s)

Program Description II

Sketch(es)

Sample Problem(s)

Solution(s)

50 D	0.3124
D	2.3616
E	4.2

Reference(s)

User Instructions

1				2
		C→HDG	Leg→t	→ Leg
Fuel Tas	Wind V	→ GS	→ TTLt	Fuel

STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1	Enter program					
2	Initialize		f E			
3	Input fuel consumption	FC (gal/hr)	A	FC		
	then input true airspeed	TAS	A	TAS		
4	Input wind*	DDD.KK	B	KK		
	then magnetic variation					
	(+E, −W)	V	B	V		
5	Input course and calculate					
	heading	C	C	HDG		
	then calculate ground speed		C	GS		
6	Input leg length and compute					
	leg time	leg length (n.m.)	D	H.MMSS**		
	then display total time		D	H.MMSS		
7	Calculate fuel used on leg		E	fuel (gal)		
8	For next leg with same					
	fuel, TAS, wind, and					
	magnetic variation go to					
	step 5. To change fuel					
	go to step 3 and input new					
	value. To change wind go to					
	step 4 and input new value.					
	To change true air speed					
	go to step 3 input fuel					
	consumption then true air					
	speed. To change magnetic					
	variation go to step 4 input					
	wind then input magnetic					
	variation. For new case go					
	to step 2.					

*DDD.KK means direction, decimal point, wind speed. 325.08 means a direction of 325 degrees and a speed of 8 knots.

**H.MMSS means hours, decimal point, minutes, seconds. 2.0355 is 2 hours 3 minutes and 55 seconds.

97 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBLe	21 16 15	
002	CLRG	16-53	
003	DSP2	-63 02	
004	RTN	24	
005	*LBLA	21 11	
006	STO1	35 01	
007	RTN	24	
008	*LBLA	21 11	
009	STO2	35 02	
010	RTN	24	
011	*LBLB	21 12	
012	ENT↑	-21	
013	INT	16 34	
014	STO3	35 03	
015	-	-45	
016	EEX	-23	
017	2	02	
018	x	-35	
019	STO8	35 08	
020	RTN	24	
021	*LBLB	21 12	
022	STO4	35 04	
023	RTN	24	
024	*LBLC	21 13	
025	DSP0	-63 00	
026	STO5	35 05	
027	RCL3	36 03	
028	RCL4	36 04	
029	-	-45	
030	X⇄Y	-41	
031	-	-45	
032	RCL8	36 08	
033	→R	44	
034	X⇄Y	-41	
035	RCL2	36 02	
036	÷	-24	
037	SIN⁻¹	16 41	
038	COS	42	
039	LSTX	16-63	
040	RCL5	36 05	
041	+	-55	
042	1	01	
043	→R	44	
044	→P	34	
045	CLX	-51	
046	X>Y?	16-34	
047	GTO1	22 01	
048	CLX	-51	
049	+	-55	
050	RTN	24	
051	*LBL1	21 01	
052	CLX	-51	
053	3	03	
054	6	06	
055	0	00	
056	+	-55	
057	RTN	24	
058	*LBLC	21 13	
059	R↓	-31	
060	RCL2	36 02	
061	x	-35	
062	X⇄Y	-41	
063	-	-45	
064	RTN	24	
065	*LBLD	21 14	
066	X⇄Y	-41	
067	÷	-24	
068	STO7	35 07	
069	ST+6	35-55 06	
070	DSP4	-63 04	
071	→HMS	16 35	
072	RTN	24	
073	*LBLD	21 14	
074	RCL6	36 06	
075	→HMS	16 35	
076	RTN	24	
077	*LBLE	21 15	
078	RCL7	36 07	
079	RCL1	36 01	
080	x	-35	
081	DSP1	-63 01	
082	RTN	24	
090			
100			
110			

FLAGS	
0	
1	
2	
3	

SET STATUS

FLAGS	ON	OFF
0	☐	☑
1	☐	☑
2	☐	☑
3	☐	☑

TRIG	
DEG	☑
GRAD	☐
RAD	☐

DISP	
FIX	☑
SCI	☐
ENG	☐
n	1

REGISTERS

0	1	2	3	4	5	6	7	8	9
	Fuel	TAS	DDD	V	C	TOTALt	LEG TIME	WIND	

S0	S1	S2	S3	S4	S5	S6	S7	S8	S9

A	B	C	D	E	I

Program Description I

Program Title Flight Management

Contributor's Name HP-67/97 Users' Library, Hewlett-Packard Company

Address 1000 N. E. Circle Boulevard

City Corvallis **State** OR **Zip Code** 97330

Program Description, Equations, Variables This program calculates either time flown, distance flown or ground speed using the other two variables as inputs. Since the equations are analogous, fuel consumed, fuel consumption or time flown can also be calculated if two of the values are known. The program is very useful in calculating ETA and fuel reserves from in-flight data.

TIME = DIST/GS

DIST = GS x TIME

GS = DIST/TIME

FUEL = FC x TIME

FC = FUEL/TIME

TIME = FUEL/FC

where

DIST is distance flown, GS is ground speed, and FC is fuel consumption.

Operating Limits and Warnings Fuel consumption and fuel must be in compatible units; i.e., gal/hr and gal, or liters/hr and liters. GS and DIST must be in compatible units; i.e., knots and nautical miles, or miles/hr and miles.

Program Description II

Sketch(es)

Sample Problem(s) A 380 nautical mile flight will be made at an estimated ground speed of 105 knots. The fuel consumption is 8 gal/hr. Find the estimated time for the flight and fuel consumed.

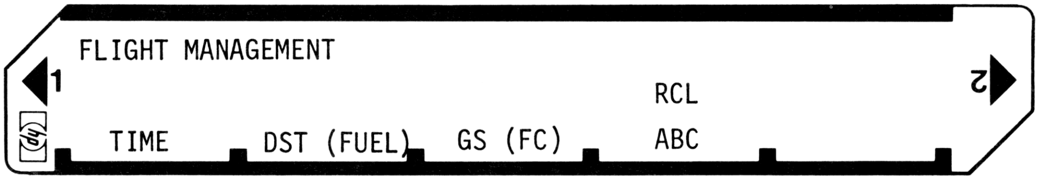
Solution(s) Time = 3 hrs, 37 min, 8 seconds
Fuel Consumed = 28.95 gal

Keystrokes:	See Displayed:
380 [B] 105 [C] [A]	3.3709
8 [C] [B]	28.95

Reference(s)

This program is a direct translation of a program from the HP-65 Aviation Pac.

User Instructions



STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1	Enter program			
2	For time-distance calculations go to step 5			
3	Input two of the following			WRONG
	time (H.MMSS)*	time	A	~~0.00~~
	fuel consumed	fuel	B	~~0.00~~
	fuel consumption per hr.	FC	C	~~0.00~~
4	Compute the remaining value**			
	time (H.MMSS)		A	time
	or fuel consumed		B	fuel
	or fuel consumption		C	FC
5	Input two of the following			
	time (H.MMSS)	time	A	~~0.00~~
	distance	DIST	B	~~0.00~~
	ground speed	GS	C	~~0.00~~
6	Compute the remaining value			
	time (H.MMSS)		A	time
	or distance		B	DIST
	or ground speed		C	GS
7	For new case change appropriate inputs in step			
	3 or 5.			
8	To recall values in the order they appear on		D	(time)
	card			(fuel or DIST)
				(FC or GS)
	*H.MMSS means hours, decimal points, minutes,			
	seconds. 2.0355 is 2 hours 3 minutes and			
	55 seconds.			

97 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBLA	21 11	
002	HMS→	16 36	
003	STO1	35 01	
004	F3?	16 23 03	time
005	RTN	24	
006	DSP4	-63 04	
007	RCL2	36 02	
008	RCL3	36 03	
009	÷	-24	
010	STO1	35 01	
011	→HMS	16 35	
012	RTN	24	
013	*LBLB	21 12	
014	DSP2	-63 02	
015	STO2	35 02	
016	F3?	16 23 03	For D
017	RTN	24	
018	RCL1	36 01	
019	RCL3	36 03	
020	×	-35	
021	STO2	35 02	
022	RTN	24	
023	*LBLC	21 13	
024	DSP2	-63 02	
025	STO3	35 03	
026	F3?	16 23 03	For GS
027	RTN	24	
028	RCL2	36 02	
029	RCL1	36 01	
030	÷	-24	
031	STO3	35 03	
032	RTN	24	
033	*LBLD	21 14	
034	RCL1	36 01	
035	→HMS	16 35	
036	DSP4	-63 04	
037	PSE	16 51	
038	RCL2	36 02	
039	DSP2	-63 02	
040	PSE	16 51	
041	RCL3	36 03	
042	PSE	16 51	
043	RTN	24	

FLAGS	SET STATUS		
	FLAGS (ON / OFF)	TRIG	DISP
0	0 ☐ ☒	DEG ☐	FIX ☐
1	1 ☐ ☒	GRAD ☐	SCI ☐
2	2 ☐ ☒	RAD ☐	ENG ☐
3	3 ☐ ☒		n 2

REGISTERS

0	1	2	3	4	5	6	7	8	9
	Time	Fuel or Dist.	FC or GS						

S0	S1	S2	S3	S4	S5	S6	S7	S8	S9

A	B	C	D	E	I

Program Description I

Program Title Predicting Freezing Levels

Contributor's Name HP-67/97 Users' Library Hewlett-Packard Company

Address 1000N. E. Circle Boulevard

City Corvallis **State** OR **Zip Code** 97330

Program Description, Equations, Variables

The program computes the theoretical freezing level in feet above mean sea level, from altitude and temperatures in either fahrenheit or Celsius and computes the freezing level in both clouds (wet lapse rate of 1.5 degrees Celsius per 1000 feet) and in clear weather (dry lapse rate of 2 degrees Celsius per 1000 feet).

This program computes the freezing level from

$$FLD = Alt + 1000\,(T/2) \text{ (Freezing level dry)}$$
$$FLW = Alt + 1000\,(T/1.5) \text{ (freezing level wet)}$$

where temperature (T) is in degrees Celsius and altitude (Alt) is in feet or

$$FLD = Alt + 1000\left(\frac{T-32}{3.6}\right)$$

$$FLW = Alt + 1000\left(\frac{T-32}{2.7}\right)$$

where temperature (T) is in degrees fahrenheit.

Operating Limits and Warnings

Limits and Warnings

The actual lapse rate may differ from the standard lapse rate used in this program. This is especially true within 2000 feet of the ground where inversions are common. Also, the program does not give the correct answer when the atmosphere between you and the freezing level contains layers of clouds. When in doubt compute both wet and dry freezing levels and use the more pessimistic value.

Program Description II

Sketch(es)

Sample Problem(s)

If the outside air temperature is -9 degrees centigrade at 8000 feet, how high is the wet freezing level?

Solution(s)

Solution

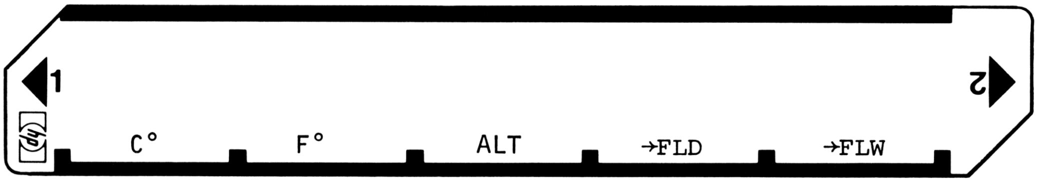
Altitude = 2000 feet

Keystrokes	See Displayed
9 [CHS] [A] 8000 [C] [E]	2000

Reference(s)

This program is a direct translation of a program from the HP-65 Aviation Pac.

User Instructions



STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS		OUTPUT DATA/UNITS
1	Enter program.				
2	Input altitude	feet	C		
	and corresponding temperature				
	in C°	C°	A		
	or F°	F°	B		
3	Calculate either or both				
	Dry freezing level		D		feet
	or wet freezing level	1	E		feet
4	For new case, go to step 2.				

97 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBLA	21 11	
002	STO7	35 07	
003	SF1	16 21 01	
004	RTN	24	
005	*LBLB	21 12	
006	STO7	35 07	
007	CF1	16 22 01	
008	RTN	24	
009	*LBLC	21 13	
010	STO8	35 08	
011	RTN	24	
012	*LBLD	21 14	
013	F1?	16 23 01	
014	GTOa	22 16 11	
015	RCL7	36 07	
016	3	03	
017	2	02	
018	-	-45	
019	3	03	
020	.	-62	
021	6	06	
022	÷	-24	
023	EEX	-23	
024	3	03	
025	x	-35	
026	RCL8	36 08	
027	+	-55	
028	RTN	24	
029	*LBLa	21 16 11	
030	RCL7	36 07	
031	2	02	
032	÷	-24	
033	EEX	-23	
034	3	03	
035	x	-35	
036	RCL8	36 08	
037	+	-55	
038	RTN	24	
039	*LBLE	21 15	
040	F1?	16 23 01	
041	GTOb	22 16 12	
042	RCL7	36 07	
043	3	03	
044	2	02	
045	-	-45	
046	2	02	
047	.	-62	
048	7	~~07~~ ÷	
049	EEX	-23	
050	3	03	
051	x	-35	
052	RCL8	36 08	
053	+	-55	
054	RTN	24	
055	*LBLb	21 16 12	
056	RCL7	36 07	
057	1	01	
058	.	-62	
059	5	05	
060	÷	-24	
061	EEX	-23	
062	3	03	
063	x	-35	
064	RCL8	36 08	
065	+	-55	
066	RTN	24	

FLAGS	
0	
1	
2	
3	

SET STATUS

FLAGS	ON	OFF
0	☐	☒
1	☐	☒
2	☐	☒
3	☐	☒

TRIG	
DEG	☒
GRAD	☐
RAD	☐

DISP	
FIX	☒
SCI	☐
ENG	☐
n	2

REGISTERS

0	1	2	3	4	5	6	7	8	9
							Temp	Alt	

S0	S1	S2	S3	S4	S5	S6	S7	S8	S9

A	B	C	D	E	I

Program Description I

Program Title General Aircraft Weight and Balance

Contributor's Name Hewlett-Packard

Address 1000 N.E. Circle Blvd.

City Corvallis **State** Oregon **Zip Code** 97330

Program Description, Equations, Variables

The program calculates the final values of gross weight and moment or gross weight and center of gravity that are used to determine your position in the weight-balance envelope furnished with your aircraft. The program will accept either weights and moments or weights and moment arms for inputs. The program is written to accommodate changes in loading without restarting from the beginning.

The center of gravity is computed by dividing the sum of the moments by the gross weight.

Operating Limits and Warnings

Program Description II

Sketch(es)

Sample Problem(s)

Sample Problem

The following table gives weight and balance data for an aircraft.

Item	Weight	Arm	Moment
Empty plane	1200		15000
Pilot	180	11.25	
Passenger	110	41	
Oil	15		−500
Fuel	120	25	

Find the gross weight, total moment and center of gravity.

Solution(s)

Solution

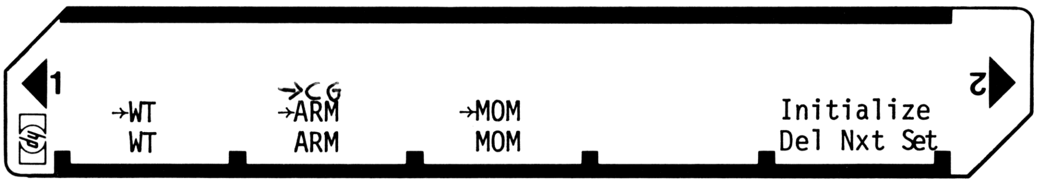
Weight = 1625
Center Gravity = 14.79
Moment = 24,035

Keystrokes	See Displayed
[f] [E] 1200 **A** 15000 **C** 180 **A** 11.25 **B**	
110 **A** 41 **B** 15 **A** 500 [CHS] **C**	
f **A**	1625
f **B**	14.79
f **C**	24035

Reference(s)

This program is a direct translation of a program from the HP-65 Aviation Pac.

User Instructions



STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS		OUTPUT DATA/UNITS
1.	Enter program				
2.	Initialize		f	E	
3.	Input weight	weight	A		Sum Wt.
4.	Input either the moment arm or the moment	arm	B		Sum. Mt.
		mom	C		Sum. Mt.
5.	Repeat steps 3,4 until all weights and moments have been input				
6.	Calculate the following sum of weights or		f	A	Sum Wt.
	center of gravity		f	B	c.g.
	or sum of moments		f	C	Sum Mt.
7.	To delete the last set of weight-arm or weight-moment data points		R/S		
8.	To delete any set of data points press [E], then perform steps 3 and 4 inputing the data is to be deleted. ([E] must be pressed before each data pair to be deleted.)		E		

97 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBLA	21 11	
002	F2?	16 23 02	
003	GTO1	22 01	
004	ST+1	35-55 01	
005	STO3	35 03	
006	RCL1	36 01	
007	GTO9	22 09	
008	*LBL1 32	21 01	
009	CHS	-22	
010	ST+1	35-55 01	
011	STO3	35 03	
012	RCL1	36 01	
013	GTO9	22 09	
014	*LBLa	21 16 11	
015	RCL1	36 01	
016	RTN	24	
017	*LBLB	21 12	
018	RCL3	36 03	
019	x	-35	
020	F2?	16 23 02	
021	CHS	-22	
022	ST+2	35-55 02	
023	STO4	35 04	
024	RCL2	36 02	
025	GTO9	22 09	
026	*LBLb	21 16 12	
027	RCL2	36 02	
028	RCL1	36 01	
029	÷	-24	
030	GTO9	22 09	
031	*LBLC	21 13	
032	F2?	16 23 02	
033	GTO3	22 03	
034	ST+2	35-55 02	
035	STO4	35 04	
036	RCL2	36 02	
037	GTO9	22 09	
038	*LBL3	21 03	
039	ST-2	35-45 02	
040	*LBLc	21 16 13	
041	RCL2	36 02	
042	*LBL9	21 09	
043	R/S	51	
044	RCL3	36 03	
045	ST-1	35-45 01	
046	RCL4	36 04	
047	ST-2	35-45 02	
048	CLX	-51	
049	STO3	35 03	
050	STO4	35 04	
051	GTO9	22 09	
052	*LBLE	21 15	
053	SF2	16 21 02	
054	RTN	24	
055	*LBLe	21 16 15	
056	CLRG	16-53	
057	RTN	24	
058	R/S	51	

070

080

090

100

110

FLAGS	
0	
1	
2	
3	

SET STATUS

FLAGS	ON	OFF
0	☐	☑
1	☐	☑
2	☐	☑
3	☐	☑

TRIG	
DEG	☑
GRAD	☐
RAD	☐

DISP	
FIX	☑
SCI	☐
ENG	☐
n	2

REGISTERS

0	1	2	3	4	5	6	7	8	9
	Σwt	Σmt	wt	mt					

S0	S1	S2	S3	S4	S5	S6	S7	S8	S9

A	B	C	D	E	I

Program Description I

Program Title Pilot Unit Conversions

Contributor's Name Hewlett-Packard
Address 1000 N.E. Circle Blvd.
City Corvallis **State** Oregon **Zip Code** 97330

Program Description, Equations, Variables

This program performs unit conversions commonly encountered by pilots. Included are conversions between Fahrenheit and Celsius degrees, statute miles and nautical miles, liters and gallons, and gallons of gasoline and pounds of gasoline.

Equations:

$°F = 1.8\ °C + 32$
$°C = (°F - 32)/1.8$
statute miles = nautical miles/0.868978
gallons = liters/0.2642
pounds gasoline = gallons gasoline x 6

Operating Limits and Warnings

Program Description II

Sketch(es)

Sample Problem(s)

Sample Problems

1. Convert 10 pounds of gasoline to gallons of gasoline.
2. Convert 40 gallons to liters.
3. Convert 100 statute miles to nautical miles.
4. Convert 212 degrees Fahrenheit to degrees Celsius.

Solution(s)

Solutions

1. 1.67 gallons
2. 151.40 liters
3. 86.90 nautical miles
4. 100°C

Keystrokes	See Display
1. 10 [f] [d]	1.67
2. 40 [f] [C]	151.40
3. 100 [B]	86.90
4. 212 [A]	100.00

Reference(s)

This program is a direct translation of a program from the HP-65 Aviation Pac.

User Instructions

1				2
→F°	→Stat	→Lit	→Gas	
→C°	→N.M.	→Gal	→Lbs	

STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS		OUTPUT DATA/UNITS
1.	Enter program				
2.	Convert from				
	Fahrenheit to Celsius	°F	A		°C
	or statute miles to nautical miles	s.m.	B		n.m.
	or liters to gallons	liters	C		gallons
	or gallons gasoline to pounds	gal/(gas)	D		lbs(gas)
3.	Convert from				
	Celsius to Fahrenheit	°C	f	A	°F
	or nautical miles to statute miles	n.m.	f	B	s.m.
	or gallons to liters	gallons	f	C	liters
	or pounds gasoline to gallons	lbs(gas)	f	D	gal(gas)
4.	For next conversion go to step 3 or 4				

97 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBLA	21 11	
002	3	03	
003	2	02	
004	-	-45	
005	1	01	
006	.	-62	
007	8	08	
008	÷	-24	
009	RTN	24	
010	*LBLa	21 16 11	
011	1	01	
012	.	-62	
013	8	08	
014	x	-35	
015	3	03	
016	2	02	
017	+	-55	
018	RTN	24	
019	*LBLB	21 12	
020	.	-62	
021	8	08	
022	6	06	
023	8	08	
024	9	09	
025	7	07	
026	8	08	
027	x	-35	
028	RTN	24	
029	*LBLb	21 16 12	
030	.	-62	
031	8	08	
032	6	06	
033	8	08	
034	9	09	
035	7	07	
036	8	08	
037	÷	-24	
038	RTN	24	
039	*LBLC	21 13	
040	.	-62	
041	2	02	
042	6	06	
043	4	04	
044	2	02	
045	x	-35	
046	RTN	24	
047	*LBLc	21 16 13	
048	.	-62	
049	2	02	
050	6	06	
051	4	04	
052	2	02	
053	÷	-24	
054	RTN	24	
055	*LBLD	21 14	
056	6	06	
057	x	-35	
058	RTN	24	
059	*LBLd	21 16 14	
060	6	06	
061	÷	-24	
062	RTN	24	
070			
080			
090			
100			
110			

FLAGS	SET STATUS		
0	FLAGS (ON / OFF)	TRIG	DISP
1	0 ☐ ☑	DEG ☑	FIX ☑
2	1 ☐ ☑	GRAD ☐	SCI ☐
3	2 ☐ ☑	RAD ☐	ENG ☐
	3 ☐ ☑		n 2

REGISTERS

0	1	2	3	4	5	6	7	8	9
S0	S1	S2	S3	S4	S5	S6	S7	S8	S9
A	B	C	D	E	I				

Program Description I

Program Title Turn Performance

Contributor's Name HP-67/97 Users' Library Hewlett-Packard Company

Address 1000 N. E. Circle Boulevard

City Corvallis **State** OR **Zip Code** 97330

Program Description, Equations, Variables This program calculates the G-force, turn diameter, time required to complete a 360° turn, and stall speed for an airplane as a function of an aircraft's bank angle, airspeed and normal stall speed.

$$G = \frac{1}{\cos(\text{bank})}$$

$$\text{Diameter} = \frac{TAS^2}{34208 \tan(\text{bank})}$$

$$\text{time} = \frac{0.0055\ TAS}{\tan(\text{bank})}$$

$$\text{stall} = (\text{normal stall}) \sqrt{G}$$

Operating Limits and Warnings All values assume coordinated turns and no vertical accelerations. Gusty conditions will alter the calculated results significantly.

Program Description II

Sketch(es)

Sample Problem(s) Calculate the G-force, diameter of turn, time required for a 360° turn, and stall speed for an aircraft in a 30° and 45° bank with a cruising speed of 115 knots and a stall speed of 60 knots.

Solution(s)

Bank	G	stall	Diameter	time
30°	1.15	64.47 Knots	0.67 n.m.	1 min 5 sec
45°	1.41	71.35 Knots	0.39 n.m.	38 sec

Keystrokes:	See Displayed:
[f] [a] 115 [A] 60 [B] 30 [C] [D]	1.15
[f] [d]	64.47
[E]	0.67
[f] [e]	1.05

Reference(s)

This program is a direct translation of a program from the HP-65 Aviation Pac.

Program Description II

Sketch(es)

Sample Problem(s)

Solution(s)

45 [C] [D]	1.41
[f] [d]	71.35
[E]	0.39
[f] [e]	0.38

Reference(s)

User Instructions

1					2
INITIALIZE			→Knots	→M.SS*	
TAS	STALL	BANK	→G	→n.m.	

STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS		OUTPUT DATA/UNITS
1	Enter program				
2	Initialize		f	a	
3	Input all of the following				
	true airspeed	knots	A		knots
	normal stall speed	knots	B		knots
	degrees of bank	degrees	C		degrees
4	Calculate acceleration		D		G
	then turn stall speed		f	d	knots
	Calculate turn diameter		E		n.m.
	then time of turn		f	e	M.SS*
5	For new case go to step 3 and change				
	appropriate inputs				

97 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBLa	21 16 11	
002	DEG	16-21	
003	DSP2	-63 02	
004	RTN	24	
005	*LBLA	21 11	
006	STO1	35 01	
007	RTN	24	
008	*LBLB	21 12	
009	STO2	35 02	
010	RTN	24	
011	*LBLC	21 13	
012	STO3	35 03	
013	RTN	24	
014	*LBLD	21 14	
015	RCL3	36 03	
016	COS	42	
017	1/X	52	
018	RTN	24	
019	*LBLd	21 16 14	
020	GSBD	23 14	
021	√X	54	
022	RCL2	36 02	
023	×	-35	
024	RTN	24	
025	*LBLE	21 15	
026	RCL1	36 01	
027	X²	53	
028	3	03	
029	4	04	
030	2	02	
031	0	00	
032	8	08	
033	÷	-24	
034	RCL3	36 03	
035	TAN	43	
036	÷	-24	
037	RTN	24	
038	*LBLe	21 16 15	
039	RCL1	36 01	
040	.	-62	
041	0	00	
042	0	00	
043	5	05	
044	5	05	
045	×	-35	
046	RCL3	36 03	
047	TAN	43	
048	÷	-24	
049	→HMS	16 35	
050	RTN	24	
060			
070			
080			
090			
110			

LABELS

A TAS	B STALL	C BANK	D G	E n.m.
a	b	c	d KNOTS	e M.SS
0	1	2	3	4
5	6	7	8	9

FLAGS

0	
1	
2	
3	

SET STATUS

FLAGS	ON	OFF
0	☐	☒
1	☐	☒
2	☐	☒
3	☐	☒

TRIG	
DEG	☒
GRAD	☐
RAD	☐

DISP	
FIX	☒
SCI	☐
ENG	☐
n	2

REGISTERS

0	1 TAS	2 stall	3 bank	4	5	6	7	8	9
S0	S1	S2	S3	S4	S5	S6	S7	S8	S9

A	B	C	D	E	I

Program Description I

Program Title Rate of Climb and Descent

Contributor's Name HP-67/97 Users' Library Hewlett-Packard Company

Address 1000 N. E. Circle Boulevard

City Corvallis **State** OR **Zip Code** 97330

Program Description, Equations, Variables

The inputs of this program are true airspeed (TAS), elevation change (Δ ALT), and either rate-of-climb (ROC) or the distance (DIST) over which the elevation change is to occur. Outputs are rate-of-climb required to change elevation in the specified distance or, conversely, the distance required when the rate-of-climb is specified.

$$ROC = \frac{TAS\ (\Delta\ ALT)}{60\sqrt{DIST^2 + (\Delta\ ALT)^2}}$$

$$D = \frac{TAS\ \Delta\ ALT}{60\ ROC}$$

$$DIST = \sqrt{D^2 - (\Delta\ ALT)^2}$$

Operating Limits and Warnings

Constant airspeed must be maintained throughout change of altitude. No correction is made for decreased aircraft performance at increased altitude. Inputs for ROC and TAS should be conservative, average values.

Program Description II

Sketch(es)

Sample Problem(s)

1. 15 n.m. west of Las Vegas (El. 2600 ft) lies a mountain pass having an elevation of 6600 ft. Assuming a climbout TAS of 80 knots, what is the minimum ROC that you must maintain if you wish to clear the pass by 1000 feet?

2. Assume that a different aircraft climbs out at 800 ft/min. and maintains an airspeed of 120 knots. How far from the pass will it be when it is at 7600 ft?

Solution(s)

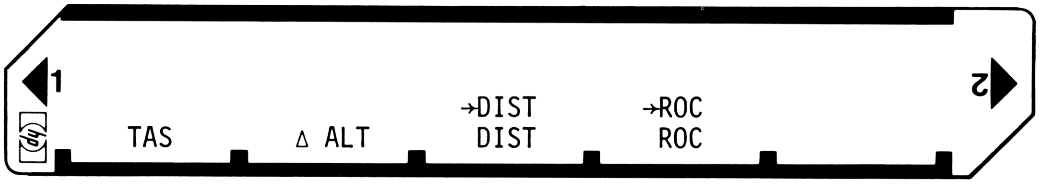
1. 443.79 ft/min
2. 2.47 n.m.

Keystrokes:	See Displayed:
1. 80 [A] 5000 [B] 15 [C] [D]	443.78
2. 120 [A] 5000 [B] 800 [D] [C]	12.47
[CHS] 15 [+]	2.53

Reference(s)

This program is a direct translation of a program from the HP-65 <u>Aviation Pac</u>.

User Instructions



STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS		OUTPUT DATA/UNITS
1	Enter program				
2	Input the following:				
	true airspeed	TAS (knots)	A		TAS
	and altitude change	ΔALT (ft)	B		ΔALT
	and either distance	DIST (n.m.)	C		DIST
	or rate-of-climb/descent	ROC (ft/min)	D		ROC
3	Calculate either distance		C		DIST (n.m.)
	or rate-of-climb/descent		D		ROC (ft/min)
4	Go to step 2 to change any values for				
	recomputation in step 3.				

97 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBLA	21 11	
002	STO6	35 06	
003	RTN	24	
004	*LBLB	21 12	
005	STO4	35 04	
006	6	06	
007	0	00	
008	7	07	
009	6	06	
010	÷	-24	
011	STO7	35 07	
012	RCL4	36 04	
013	RTN	24	
014	*LBLC	21 13	
015	F3?	16 23 03	
016	GTOc	22 16 13	Dist
017	RCL6	36 06	
018	RCL7	36 07	
019	×	-35	
020	6	06	
021	0	00	
022	÷	-24	
023	RCL5	36 05	
024	÷	-24	
025	6	06	
026	0	00	
027	7	07	
028	6	06	
029	×	-35	
030	X²	53	
031	RCL7	36 07	
032	X²	53	
033	-	-45	
034	√X	54	
035	STO3	35 03	
036	RTN	24	
037	*LBLc	21 16 13	
038	STO3	35 03	
039	RTN	24	
040	*LBLD	21 14	
041	F3?	16 23 03	
042	GTOd	22 16 14	
043	RCL6	36 06	ROC
044	RCL7	36 07	
045	×	-35	
046	6	06	
047	0	00	
048	÷	-24	
049	RCL3	36 03	
050	X²	53	
051	RCL7	36 07	
052	X²	53	
053	+	-55	
054	√X	54	
055	÷	-24	
056	6	06	
057	0	00	
058	7	07	
059	6	06	
060	×	-35	
061	STO5	35 05	
062	RTN	24	
063	*LBLd	21 16 14	
064	STO5	35 05	
065	RTN	24	

070

080

090

110

LABELS

A TAS	B ΔALT	C DIST	D ROC	E
a	b	c →DIST	d →ROC	e
0	1	2	3	4
5	6	7	8	9

FLAGS

FLAGS
0
1
2
3

SET STATUS

FLAGS	ON	OFF	TRIG		DISP	
0	☐	☒	DEG	☒	FIX	☒
1	☐	☒	GRAD	☐	SCI	☐
2	☐	☒	RAD	☐	ENG	☐
3	☐	☒			n	2

REGISTERS

0	1	2	3 DIST	4 USED	5 ROC	6 TAS	7 ΔALT (n.m.)	8	9
S0	S1	S2	S3	S4	S5	S6	S7	S8	S9

A	B	C	D	E	I

Program Description I

Program Title Head Winds and Cross Winds

Contributor's Name Hewlett-Packard

Address 1000 N.E. Circle Blvd.

City Corvallis **State** Oregon **Zip Code** 97330

Program Description, Equations, Variables

This program calculates both the head wind and cross wind components from the aircraft heading and reported winds. The program works both at altitude, where magnetic variation must be considered, and at landing and takeoff, where winds are reported in magnetic directions rather than true directions.

The head wind (HW) and right cross wind (RCW) components are computed from

$$HW = K \cos(D - HDG - V)$$

$$RCW = K \sin(D - HDG - V)$$

where

K = the reported wind velocity
D = the reported wind direction
HDG = the aircraft heading
V = the magnetic variation

Operating Limits and Warnings

Limits and Warnings

Reported winds must be less than 100 knots.

Wind directions reported by the control tower are magnetic and the variation need not be input when using the program for takeoff and landings. Other wind directions are reported in true directions and variation must be included to find the wind components.

Program Description II

Sketch(es)

Sample Problem(s)

Sample Problems

1. At takeoff on runway 28 the winds are reported as 240° at 25 knots. What are the head wind and cross wind components?
2. At altitude the wind is reported as 160° and 40 knots. Your magnetic heading is 270°. What are the head wind and cross wind components if the magnetic variation is 15° east?

Solution(s)

Solutions

1. 19.15 knots (head wind); – 16.07 knots (left cross wind)
2. –22.94 knots (tail wind); –32.77 knots (left cross wind)

Keystrokes	See Displayed
1. [f] [E] 280 [B] 240.25 [C] [D]	19.15
[E]	-16.07
2. [f] [E] 270 [B] 160.40 [C] 15 [A] [D]	-22.94
[E]	-32.77

Reference(s)

This program is a direct translation of a program from the HP-65 Aviation Pac.

User Instructions

STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS		OUTPUT DATA/UNITS
1.	Enter program				
2.	Initialize		f	E	0.00
3.	If winds are surface winds, go to				
	step 4; if not, input variation (+E,-W)	V(deg)	A		V
4.	Input both airplane heading and	HDG(deg)	B		HDG
	reported winds	DDD.KK*	C		DDD.KK
5.	Calculate either or both of the				
	following: headwind		D		knots
	right crosswind		E		knots
	NOTE: negative answers mean tailwind or left crosswind				
6.	To change any inputs go to step 3 and change only the variables affected.				
*	DDD.KK means direction, decimal point,				
	wind speed. 325.08 means a direction of 325 degrees and a speed of 8 knots.				

97 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBLA	21 11	
002	STO1	35 01	
003	RTN	24	
004	*LBLB	21 12	
005	STO2	35 02	
006	RTN	24	
007	*LBLC	21 13	
008	STO3	35 03	
009	RTN	24	
010	*LBLD	21 14	
011	RCL3	36 03	
012	INT	16 34	
013	RCL1	36 01	
014	RCL2	36 02	
015	+	-55	
016	-	-45	
017	RCL3	36 03	
018	FRC	16 44	
019	EEX	-23	
020	2	02	
021	x	-35	
022	→R	44	
023	F2?	16 23 02	
024	X⇄Y	-41	
025	DSP2	-63 02	
026	R/S	51	
027	*LBLE	21 15	
028	SF2	16 21 02	
029	GTOD	22 14	
030	*LBLe	21 16 15	
031	CLX	-51	
032	DSP2	-63 02	
033	DEG	16-21	
034	CLRG	16-53	
035	RTN	24	

SET STATUS

FLAGS	ON	OFF	TRIG		DISP	
0	☐	☐	DEG	☐	FIX	☐
1	☐	☐	GRAD	☐	SCI	☐
2	☐	☐	RAD	☐	ENG	☐
3	☐	☐			n ______	

REGISTERS

0	1	2	3	4	5	6	7	8	9
	V	HDG	DDD.KK						

S0	S1	S2	S3	S4	S5	S6	S7	S8	S9

A	B	C	D	E	I

Program Description I

Program Title Flight Planning and Flight Verification

Contributor's Name Hewlett-Packard Company, HP-67/97 Users' Library

Address 1000 N. E. Circle Boulevard

City Corvallis **State** OR **Zip Code** 97330

Program Description, Equations, Variables This program can be used for flight planning and updating the flight plan as it is being flown. The program computes ETA's, ground speeds, cumulative distance flown, actual times for each leg and cumulative time flown. The ground speeds can be changed for each leg.

$$ETA = DIST/GS + TO$$

$$GS = DIST/(ATA - TO)$$

where

ETA = estimated time of arrival

DIST = distance

GS = ground speed

TO = take off time (or time over last checkpoint)

ATA = time over current checkpoint

Operating Limits and Warnings Distances and speeds must be in compatible units (knots and n.m., or mph and miles). Ground speeds are rounded in the display to the nearest whole unit. They are carried internally to full significance.

Flight planning and flight verification are identical except that: (1) flight planning usually assumes that the take-off time is 0.00, and (2) flight planning accepts the calculated ETA as the ATA at the checkpoint.

Program Description II

Sketch(es)

Sample Problem(s) Part 1 - Flight Plan A flight consists of the following 3 legs:

	Ground speed	Distance
Leg 1	80K	20 n.m.
Leg 2	105K	53 n.m.
Leg 3	105K	41 n.m.

Make a flight plan showing the individual leg times, cumulative times, and distances at the end of each leg.

Solution	Total Distance	Total Time	Leg Time
Leg 1	20	:15:00	:15:00
Leg 2	73	:45:17	:30:17
Leg 3	114	1:08:43	:23:26

Solution(s)

	Keystrokes:	See Displayed:
1.	[f] [a] 0 [A] 80 [C] 20 [D]	20
	[E]	0.1500
	[A]	0.1500
	105 [C] 53 [D]	73
	[E]	0.4517
	[A]	0.3017
	105 [C] 41 [D]	114
	[E]	1.0843

Reference(s)

This program is a direct translation of a program from the HP-65 Aviation Pac.

Program Description II

Sketch(es)

Sample Problem(s) Part 2 - Flight Verification

Assume that the actual flight was flown with a take off time of 10:17:00. Assume that the actual times of arrival at the checkpoints were 10:31:10, 11:01:10 and 11:23:50. Find the ETA's at each checkpoint using 80 knots as the ground speed for the first leg. After finding the actual ground speed for the first leg, assume that the difference between actual and estimated speeds is the wind velocity. Add the winds to the 105 knots assumed GS for leg 2. Use the GS calculated for leg 2 as the assumed GS for leg 3.

Compute ETA's for each checkpoint, actual leg times, cumulative time and actual ground speed for the flight.

Solution(s)

[A]	0.2326
[f] [a] 10.17 [A] 80 [C] 20 [D] [E]	10.32
10.3110 [A]	0.1410
[R/S]	0.1410
[B]	85
110 [C] 53 [D]	73
[E]	11.0005
11.0110 [A]	0.3000
[R/S]	0.4410

Reference(s)

Program Description II

Sketch(es)

Sample Problem(s)

Solution	ETA	Actual leg time	Cumulative time	Calculated ground speed
Leg 1	10:32:00	14:10	14:10	85
Leg 2	11:00:04	30:00	44:10	106
Leg 3	11:24:22	22:40	1:06:50	109

Solution(s)

[B]	106
[C] 41 [D]	114
[E]	11.2422
11.2350 [A]	0.2240
[R/S]	1.0650
[B]	109

Reference(s)

User Instructions

1 TO,ATA

→LEG t | →GS | GS | DIST | →ETA

2

STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS		OUTPUT DATA/UNITS
1	Enter program				
2	Initialize		f	a	
3	Input take off time (usually 0 for flight				
	planning)	H.MMSS*	A		
4	Input ground speed	GS (knots)	C		GS
5	Input leg length and read cumulative distance	eg length (n.m.)	D		total dist (n.
6	Calculate ETA		E		H.MMSS
7	Input ATA and read leg time.	H.MMSS	A		H.MMSS
	(for flight planning do not input ETA,				
	just press [A]).				
8	To read out total elapsed time to checkpoint				
	press [R/S]		R/S		H.MMSS
9	To calculate GS on the last leg		B		GS (knots)
10	To use calculated GS for the next leg press				
	[C] and go to step 5		C		
11	If you wish to change the GS for the next leg				
	go to step 4.				
12	To use the same ground speed for the next leg				
	as you used on the last leg, go to step 5				
	*H.MMSS means hours, decimal point, minutes,				
	seconds. 2.0355 is 2 hours 3 minutes and				
	55 seconds.				

97 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBLa	21 16 11	
002	CLX	-51	
003	CLRG	16-53	
004	SF1	16 21 01	
005	*LBL0	21 00	
006	DSP0	-63 00	
007	R/S	51	
008	GTO0	22 00	
009	*LBLA	21 11	
010	RCL1	36 01	
011	STO2	35 02	
012	X⇄Y	-41	
013	STO1	35 01	
014	F1?	16 23 01	
015	GTO4	22 04	
016	X⇄Y	-41	
017	CHS	-22	
018	HMS+	16-55	
019	ENT↑	-21	
020	CLX	-51	
021	X>Y?	16-34	
022	GSBb	23 16 12	
023	HMS+	16-55	
024	RCL5	36 05	
025	X⇄Y	-41	
026	HMS+	16-55	
027	STO5	35 05	
028	LSTX	16-63	
029	*LBL4	21 04	
030	CF1	16 22 01	
031	DSP4	-63 04	
032	R/S	51	
033	RCL5	36 05	
034	GTO4	22 04	
035	*LBLC	21 13	
036	STO3	35 03	
037	GTO0	22 00	
038	*LBLD	21 14	
039	STO4	35 04	
040	ST+6	35-55 06	
041	RCL6	36 06	
042	GTO0	22 00	
043	*LBLE	21 15	
044	RCL4	36 04	
045	RCL3	36 03	
046	÷	-24	
047	→HMS	16 35	
048	RCL1	36 01	
049	HMS+	16-55	
050	2	02	
051	4	04	
052	X>Y?	16-34	
053	CLX	-51	
054	CHS	-22	
055	HMS+	16-55	
056	GTO4	22 04	
057	*LBLB	21 12	
058	RCL4	36 04	
059	RCL1	36 01	
060	RCL2	36 02	
061	CHS	-22	
062	HMS+	16-55	
063	HMS→	16 36	
064	ENT↑	-21	
065	CLX	-51	
066	X>Y?	16-34	
067	GSBb	23 16 12	
068	+	-55	
069	÷	-24	
070	GTO0	22 00	
071	*LBLb	21 16 12	
072	2	02	
073	4	04	
074	RTN	24	

LABELS

A USED	B →GS	C GS	D DIST	E
a INITIALIZE	b USED	c	d	e
0 USED	1	2	3	4 USED
5	6	7	8	9

FLAGS

FLAGS	
0	
1	
2	
3	

SET STATUS

FLAGS	ON	OFF	TRIG		DISP	
0	☐	☒	DEG	☒	FIX	☒
1	☐	☒	GRAD	☐	SCI	☐
2	☐	☒	RAD	☐	ENG	☐
3	☐	☒			n	2

REGISTERS

0	1	2	3	4	5	6	7	8	9
	t_{new}	t_{old}	GS	DIST	TOTAL TIME	TOTAL DIST			

S0	S1	S2	S3	S4	S5	S6	S7	S8	S9

A	B	C	D	E	I

Program Description I

Program Title Determining In-Flight Winds

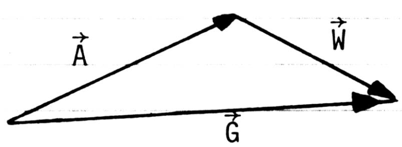
Contributor's Name HP-67/97 Users' Library Hewlett-Packard Company

Address 1000 N. E. Circle Boulevard

City Corvallis **State** OR **Zip Code** 97330

Program Description, Equations, Variables This program computes the winds at altitude from TAS, course of aircraft, ground speed and heading. Ground speed is automatically calculated from time-distance inputs. Winds can be computed as either magnetic or true. The latter must be used when verifying wind forecasts by the weather bureau. The program allows continuous updating of winds.

This program solves the wind triangle shown below.



$$\vec{A} + (\vec{W}) = \vec{G}$$

OR

$$\vec{W} = \vec{G} - \vec{A}$$

$\vec{W}$, $\vec{A}$ and $\vec{G}$ are all vector quantities representing wind direction and speed; TAS and heading; and ground speed and course respectively.

Since both $\vec{A}$ and $\vec{G}$ use magnetic directions, $\vec{W}$ is computed as a magnetic direction. It must be corrected to true heading by adding the variation (V).

True wind direction = magnetic wind direction + V

Operating Limits and Warnings

Program Description II

Sketch(es)

Sample Problem(s) After passing over a checkpoint at 3:05:20 a pilot flying a magnetic course of 150° finds that he must apply 15° right correction; i.e., steer 165° to maintain his ground course. He passes over his next checkpoint 70 n.m. away at 3:40:20. The TAS of his airplane is 110 knots and the variation is 7.5° east. If the local FSS asked him to report the winds, what would he tell them?

Solution(s)

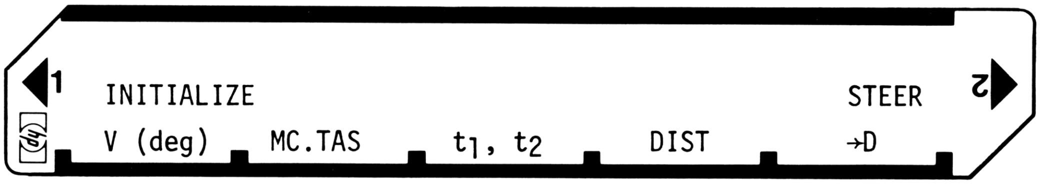
273° at 32 knots.

Keystrokes:	See Displayed:
[f] [a] 7.5 [A] 150.110 [B] 3.0520 [C] 70 [D]	
3.4020 [C] 165 [E]	273.032

Reference(s)

This program is a direct translation of a program from the HP-65 Aviation Pac.

User Instructions



STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS		OUTPUT DATA/UNITS
1	Enter program				
2	Initialize		f	A	0.0000
3	To obtain true winds rather than magnetic				
	winds input variation (+E, -W)	V(deg)	A		V
4	Input all of the following:				
	MAG course and TAS	DDD.KKK*	B		TAS
	and time at first checkpoint	t_1,(H.MMSS**)	C		H.MMSS
	and distance to next checkpoint	n.m.	D		H.MMSS
	and time at 2nd checkpoint	t_2,(H.MMSS)	C		H.MMSS
5	To calculate wind, input heading of airplane				
	required to fly course	steer(deg)	E		DDD.KKK
6	To change any variable except time over first				
	checkpoint change the variable(s) and go to				
	step 5.				
7	To change time over first checkpoint go to				
	step 2.				
	*DDD.KKK means direction, decimal point, wind				
	speed. 325.080 means a direction of 325				
	degrees and a speed of 80 knots.				
	**H.MMSS means hours, decimal point, minutes,				
	seconds. 2.0355 is 2 hours 3 minutes and				
	55 seconds.				

97 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBLa	21 16 11	
002	CLRG	16-53	
003	SF1	16 21 01	
004	DSP4	-63 04	
005	CLX	-51	
006	RTN	24	
007	*LBLA	21 11	
008	STO1	35 01	
009	RTN	24	
010	*LBLB	21 12	
011	INT	16 34	
012	STO2	35 02	
013	LSTX	16-63	
014	FRC	16 44	
015	EEX	-23	
016	3	03	
017	x	-35	
018	STO3	35 03	
019	RTN	24	
020	*LBLC	21 13	
021	STO5	35 05	
022	F1?	16 23 01	
023	STO4	35 04	
024	CF1	16 22 01	
025	RTN	24	
026	*LBLD	21 14	
027	STO6	35 06	
028	RTN	24	
029	*LBLE	21 15	
030	RCL3	36 03	
031	→R	44	
032	STO7	35 07	
033	X⇄Y	-41	
034	STO8	35 08	
035	RCL2	36 02	
036	RCL6	36 06	
037	RCL5	36 05	
038	RCL4	36 04	
039	CHS	-22	
040	HMS+	16-55	
041	HMS→	16 36	
042	÷	-24	
043	→R	44	
044	ST-7	35-45 07	
045	CLX	-51	
046	RCL8	36 08	
047	-	-45	
048	CHS	-22	
049	RCL7	36 07	
050	→P	34	
051	EEX	-23	
052	3	03	
053	÷	-24	
054	X⇄Y	-41	
055	RCL1	36 01	
056	+	-55	
057	ENT↑	-21	
058	CLX	-51	
059	X>Y?	16-34	
060	GSBe	23 16 15	
061	.	-62	
062	5	05	
063	+	-55	
064	INT	16 34	
065	+	-55	
066	DSP3	-63 03	
067	RTN	24	
068	*LBLe	21 16 15	
069	CLX	-51	
070	3	03	
071	6	06	
072	0	00	
073	+	-55	
074	RTN	24	

LABELS

A V (deg)	B MC. TAS	C t_1 t_2	D DIST	E STEER (DEG)
a	b	c	d	e
0	1	2	3	4
5	6	7	8	9

FLAGS

0	
1	
2	
3	

SET STATUS

FLAGS	ON	OFF	TRIG		DISP	
0	☐	☑	DEG	☑	FIX	☑
1	☑	☐	GRAD	☐	SCI	☐
2	☐	☑	RAD	☐	ENG	☐
3	☐	☑			n	4

REGISTERS

0	1	2	3	4	5	6	7	8	9
	VARIATION	MAG course	TAS	t_1	t_2	DIST	E_x	E_y	
S0	S1	S2	S3	S4	S5	S6	S7	S8	S9

A	B	C	D	E	I

Program Description I

Program Title Standard Atmosphere

Contributor's Name Hewlett-Packard

Address 1000 N.E. Circle Blvd.

City Corvallis **State** Oregon **Zip Code** 97330

Program Description, Equations, Variables

This program can be used to estimate atmospheric conditions from pressure altitude (PALT). It should be remembered that this is only an approximation based on average conditions.

The outputs, with the exception of temperature,, are ratios of standard sea level conditions. For instance, if the pressure ratio (P/P_0) is found to be 0.7375 and standard conditions are 29.92 inches of mercury the pressure (P) is the product of 29.92 and 0.7375 or 22.07 inches of mercury. Some standard sea level condition commonly used by pilots are

Pressure→ P_0 = 29.92 in Hg = 14.696 psi

Speed of Sound→a_0 = 661.51 knots = 1116.4 ft/sec

Density→ ρ_0 = 0.002378 lb sec^2/ft^4

From 0 to 36089 feet the following relations hold

$$T(^\circ C) = 15 - 1.981 \times 10^{-3}\ h$$

$$a/a_0 = \sqrt{T/T_0}\ ;\ T_0 = 288.15\ K$$

$$P/P_0 = \left[\frac{T_0 - 1.981 \times 10^{-3}\ h}{T_0}\right]^{5.2563}$$

$$\rho/\rho_0 = \frac{P}{P_0}\ \frac{T_0}{T}$$

Operating Limits and Warnings

Program Description I

Program Title

Contributor's Name

Address

City **State** **Zip Code**

Program Description, Equations, Variables

For altitudes between 36,089 feet and 82,000 feet, the following relations hold

$T = -56.5\ ^\circ C$

$a/a_0 = 0.8671$

$$P/P_0 = 0.2234\ e^{-\left(\frac{h-36089}{20804.9}\right)}$$

$$\rho/\rho_0 = \frac{P}{P_0}\ \frac{288.15}{216.65}$$

where

T is temperature in degrees centigrade
a is speed of sound
P is pressure
ρ is density
h is pressure altitude

Operating Limits and Warnings

Limits and Warnings PROGRAM IS VALID FROM 0 TO 82,000 FT
~~Card 1 is valid from 0 to 36089 feet, card two is valid from 36089 feet to 82,000 feet~~. There is disagreement among reference sources above 36,000 feet and below 2000 feet.

Program Description II

Sketch(es)

Sample Problem(s)

Sample Problems

1. What is the temperature and speed of sound at 27,000 feet assuming a standard atmosphere?
2. What is the density at 70,000 feet assuming a standard atmosphere?

Solution(s)

Solutions

1. 27000 [A] [B] ⟶ −38.49
   [C] ⟶ 0.90
   661.51 [x] ⟶ 596.97
2. 70000 [A] [E] ⟶ 0.06
   .002377 [x] [SCI] ⟶ 1.38×10^{-4}

Reference(s)

Reference:

Chemical Rubber Company Handbook, of Chemistry and Physics, 47th edition, 1966–1967, page F–120

This program is a direct translation of a program from the HP-65 Aviation Pac.

User Instructions

Palt	$\rightarrow T$	$\rightarrow a/a_0$	$\rightarrow P/P_0$	$\rightarrow \rho/\rho_0$

STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS		OUTPUT DATA/UNITS
1.	Enter program				
2.	Input pressure altitude	Palt	A		PALT
3.	Compute any or all of the following:				
	Temperature		B		T(C°)
	Speed of sound ratio		C		a/a_0
	Pressure ratio		D		P/P_0
	Density ratio		E		ρ/ρ_0
	For new case go to step 2				

97 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBLA	21 11	
002	3	03	
003	6	06	
004	0	00	
005	8	08	
006	9	09	
007	STO5	35 05	
008	X≤Y?	16-35	
009	GTOa	22 16 11	
010	CF0	16 22 00	
011	R↓	-31	
012	STO1	35 01	
013	2	02	
014	8	08	
015	8	08	
016	.	-62	
017	1	01	
018	5	05	
019	STO3	35 03	
020	RCL1	36 01	
021	RTN	24	
022	*LBLa	21 16 11	
023	SF0	16 21 00	
024	R↓	-31	
025	STO1	35 01	
026	2	02	
027	8	08	
028	8	08	
029	.	-62	
030	1	01	
031	5	05	
032	STO3	35 03	
033	RCL1	36 01	
034	RTN	24	
035	*LBLB	21 12	
036	F0?	16 23 00	
037	GTOb	22 16 12	
038	1	01	
039	5	05	
040	RCL1	36 01	
041	1	01	
042	9	09	
043	8	08	
044	1	01	
045	EEX	-23	
046	CHS	-22	
047	6	06	
048	×	-35	
049	-	-45	
050	RTN	24	
051	*LBLb	21 16 12	
052	5	05	
053	6	06	
054	.	-62	
055	5	05	
056	CHS	-22	
057	RTN	24	
058	*LBLC	21 13	
059	F0?	16 23 00	
060	GTOc	22 16 13	
061	GSBB	23 12	
062	2	02	
063	7	07	
064	3	03	
065	.	-62	
066	1	01	
067	5	05	
068	+	-55	
069	RCL3	36 03	
070	÷	-24	
071	√X	54	
072	RTN	24	
073	*LBLc	21 16 13	
074	.	-62	
075	8	08	
076	6	06	
077	7	07	
078	1	01	
079	RTN	24	
080	*LBLD	21 14	
081	F0?	16 23 00	
082	GTOd	22 16 14	
083	RCL3	36 03	
084	RCL1	36 01	
085	1	01	
086	9	09	
087	8	08	
088	1	01	
089	EEX	-23	
090	CHS	-22	
091	6	06	
092	×	-35	
093	-	-45	
094	STO4	35 04	
095	RCL3	36 03	
096	÷	-24	
097	5	05	
098	.	-62	
099	2	02	
100	5	05	
101	6	06	
102	3	03	
103	Y^X	31	
104	STO6	35 06	
105	RTN	24	
106	*LBLd	21 16 14	
107	RCL1	36 01	
108	RCL5	36 05	
109	-	-45	
110	2	02	
111	0	00	
112	8	08	

REGISTERS

0	1	2	3	4	5	6	7	8	9
	h		288.15	T(k)	36089	P/P_0			

S0	S1	S2	S3	S4	S5	S6	S7	S8	S9

A	B	C	D	E	I

97 Program Listing II

STEP	KEY ENTRY	KEY CODE	COMMENTS
113	0	00	
114	4	04	
115	.	-62	
116	9	09	
117	÷	-24	
118	CHS	-22	
119	e^x	33	
120	.	-62	
121	2	02	
122	2	02	
123	3	03	
124	4	04	
125	×	-35	
126	STO6	35 06	
127	RTN	24	
128	*LBLE	21 15	
129	F0?	16 23 00	
130	GTOe	22 16 15	
131	GSBD	23 14	
132	RCL3	36 03	
133	×	-35	
134	RCL4	36 04	
135	÷	-24	
136	RTN	24	
137	*LBLe	21 16 15	
138	GSBd	23 16 14	
139	RCL3	36 03	
140	×	-35	
141	2	02	
142	1	01	
143	6	06	
144	.	-62	
145	6	06	
146	5	05	
147	÷	-24	
148	RTN	24	
149	R/S	51	
150			
160			

STEP	KEY ENTRY	KEY CODE	COMMENTS
170			
180			
190			
200			
210			
220			

LABELS

A P_{ALT}	B → T	C → σ/σ_0	D → P/P_0	E ρ/ρ_0
a	b	c	d	e
0	1	2	3	4
5	6	7	8	9

FLAGS

0	
1	
2	
3	

SET STATUS

FLAGS	ON	OFF	TRIG		DISP	
0	☐	☑	DEG	☑	FIX	☑
1	☐	☑	GRAD	☐	SCI	☐
2	☐	☑	RAD	☐	ENG	☐
3	☐	☑			n 2	

Program Description I

Program Title Mach Number and True Air Speed

Contributor's Name Hewlett-Packard

Address 1000 N.E. Circle Blvd.

City Corvallis **State** Oregon **Zip Code** 97330

Program Description, Equations, Variables

This program converts calibrated airspeed (CAS) to mach number and true airspeed (TAS). Pressure altitude (PALT) must be known to calculate mach number (M). Aircraft recovery coefficient (C_T) and indicated air temperature (IT) must also be known to calculate true airspeed. The recovery coefficient varies from 0.6 to 1.0 but is around 0.8 for most aircraft.

$$\text{Pressure ratio}\left(\frac{P}{P_0}\right) = \left[\frac{518.67 - 3.566 \times 10^{-3}\ \text{PALT}}{518.67}\right]^{5.2563}$$

$$M^2 = 5\left[\left(\frac{P_0}{P}\left\{\left[1 + 0.2\left(\frac{\text{CAS}}{661.5}\right)^2\right]^{3.5} - 1\right\} + 1\right)^{0.286} - 1\right]$$

$$\text{TAS} = 39M\sqrt{(\text{IT} + 273)\left[C_T\left(\frac{1}{(1 + 0.2\,M^2)} - 1\right) + 1\right]}$$

Operating Limits and Warnings

Limits and Warnings

Accuracy degenerates for mach numbers in excess of one.

Program Description II

Sketch(es)

Sample Problem(s)

1. For a pressure altitude of 25,500 feet, a calibrated airspeed of 350 knots, a recover factor of 0.8, and an indicated air temperature of 5 degrees Celsius, what is the flight mach number and the true airspeed?
2. For a pressure altitude of 40,000 feet with all other data unchanged, what is the mach number and the true airspeed?

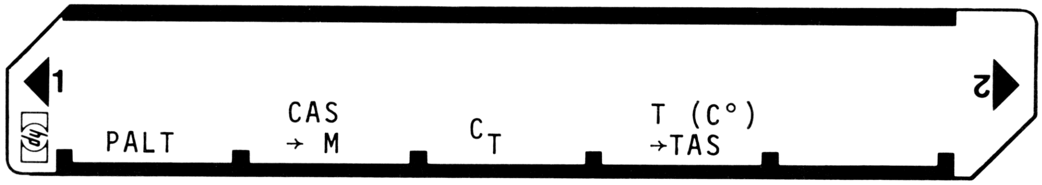
Solution(s)

	Keystrokes	See Displayed
1.	25500 [A] 350 [B]	0.84
	.8 [C] 5[D]	515.76
2.	40000 [A] 350 [B]	1.10
	.8 [C] 5[D]	657.42

Reference(s)

This program is a direct translation of a program from the HP-65 Aviation Pac.

User Instructions



STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS		OUTPUT DATA/UNITS
1.	Enter program				
2.	Input pressure altitude	PALT	A		P/P_0
3.	Input calibrated airspeed in knots and calculate mach number	CAS	B		M
4.	Input recovery coefficient (.8 for most aircraft)	C_T	C		C_T
5.	Input indicated air temperature and calculate true airspeed in knots	IT (°C)	D		TAS
6.	For same aircraft at same PALT go to step 4. For different PALT go to step 2 and skip step 4. For totally new case go to step 2.				

97 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBLA	21 11	
002	3	03	
003	6	06	
004	0	00	
005	8	08	
006	9	09	
007	X≤Y?	16-35	
008	GTOa	22 16 11	
009	X⇄Y	-41	
010	3	03	
011	5	05	
012	6	06	
013	6	06	
014	EEX	-23	
015	CHS	-22	
016	6	06	
017	×	-35	
018	CHS	-22	
019	5	05	
020	1	01	
021	8	08	
022	.	-62	
023	6	06	
024	7	07	
025	+	-55	
026	LSTX	16-63	
027	÷	-24	
028	5	05	
029	.	-62	
030	2	02	
031	5	05	
032	6	06	
033	3	03	
034	Yˣ	31	
035	STO6	35 06	
036	RTN	24	
037	*LBLa	21 16 11	
038	-	-45	
039	2	02	
040	0	00	
041	8	08	
042	0	00	
043	4	04	
044	.	-62	
045	9	09	
046	÷	-24	
047	CHS	-22	
048	eˣ	33	
049	.	-62	
050	2	02	
051	2	02	
052	3	03	
053	4	04	
054	×	-35	
055	STO6	35 06	
056	RTN	24	
057	*LBLB	21 12	
058	6	06	
059	6	06	
060	1	01	
061	.	-62	
062	5	05	
063	÷	-24	
064	X²	53	
065	.	-62	
066	2	02	
067	×	-35	
068	1	01	
069	+	-55	
070	3	03	
071	.	-62	
072	5	05	
073	Yˣ	31	
074	1	01	
075	-	-45	
076	RCL6	36 06	
077	÷	-24	
078	1	01	
079	+	-55	
080	.	-62	
081	2	02	
082	8	08	
083	6	06	
084	Yˣ	31	
085	1	01	
086	-	-45	
087	5	05	
088	×	-35	
089	√X	54	
090	STO4	35 04	
091	RTN	24	
092	*LBLC	21 13	
093	STO3	35 03	
094	RTN	24	
095	*LBLD	21 14	
096	2	02	
097	7	07	
098	3	03	
099	+	-55	
100	STO5	35 05	
101	RCL4	36 04	
102	X²	53	
103	.	-62	
104	2	02	
105	×	-35	
106	1	01	
107	+	-55	
108	÷	-24	
109	RCL5	36 05	
110	-	-45	
111	RCL3	36 03	
112	×	-35	

REGISTERS

0	1	2	3 C_T	4 M	5 IT(K)	6 P/P_0	7	8	9
S0	S1	S2	S3	S4	S5	S6	S7	S8	S9

A	B	C	D	E	I

97 Program Listing II

STEP	KEY ENTRY	KEY CODE	COMMENTS
113	RCL5	36 05	
114	+	-55	
115	√X	54	
116	3	03	
117	9	09	
118	x	-35	
119	RCL4	36 04	
120	x	-35	
121	RTN	24	
122	R/S	51	
130			
140			
150			
160			
170			
180			
190			
200			
210			
220			

LABELS					FLAGS
A	B	C	D	E	0
a	b	c	d	e	1
0	1	2	3	4	2
5	6	7	8	9	3

SET STATUS

FLAGS	ON	OFF	TRIG		DISP	
0	☐	☐	DEG	☐	FIX	☐
1	☐	☐	GRAD	☐	SCI	☐
2	☐	☐	RAD	☐	ENG	☐
3	☐	☐			n ______	

Program Description I

Program Title True Air Temperature and Density Altitude

Contributor's Name Hewlett-Packard Company, HP-67/97 Users' Library

Address 1000 N. E. Circle Boulevard

City Corvallis **State** OR **Zip Code** 97330

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Program Description, Equations, Variables This program accounts for the compressibility effects of high speed flight. Given the mach number (M) (which can be calculated using Mach Number and True Airspeed, AV1-12A) and the aircraft recovery coefficient (C_T = 0.8 for most aircraft), indicated air temperature (IT) is converted to true air temperature (T). True air temperature and pressure altitude are then converted to density altitude. For low flight mach numbers, compressibility effects are small. In such cases only temperature and pressure altitude (PALT) are needed to calculate density altitude (DALT).

$$T(k) = C_T\left(\frac{IT(K)}{0.205\ M^2 + 1} - IT\right) + IT(K)$$

$$DALT = 145366\left[1 - \left(\frac{\rho}{\rho_0}\right)^{0.235}\right]$$

where

$$\frac{\rho}{\rho_0} = \frac{288.15}{T(K)}\left[1 - 6.876 \times 10^{-6}\ PALT\right]^{5.256}$$

Operating Limits and Warnings The program is limited to altitudes under 36089 feet.

Program Description II

Sketch(es)

Sample Problem(s)

1. M = 0.87

   C_T = 0.80

   IT = 8°C

   PALT = 10,000 feet

2. For a low speed aircraft

   T = 12°C

   PALT = 9,000 feet

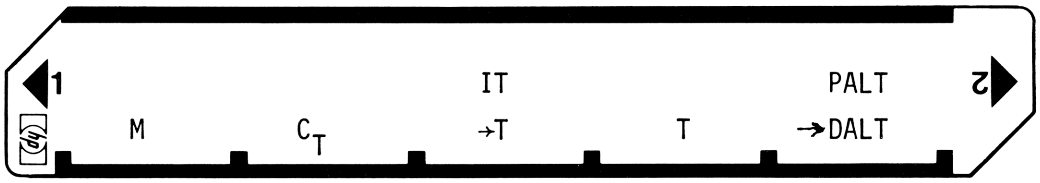
Solution(s)

Keystrokes:	See Displayed:	
1. .87 [A] .8 [B] 8 [C] 10000 [E]	-22.21	T
	7852.96	DALT
2. 12 [D] 9000 [E]	10703.11	DALT

Reference(s)

This program is a direct translation of a program from the HP-65 Aviation Pac.

User Instructions



STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1	Enter program			
2	If you know the true air temperature go to step 6			
3	Input the following:			
	mach number	M	A	M
	recovery coefficient	C_T	B	C_T
4	Input indicated air temperature and calculate true air temperature	IT (°C)	C	T (°C)
5	Go to step 7			
6	Input true air temperature	T (°C)	D	T (K)
7	Input pressure altitude and calculate density altitude	PALT	E	DALT (ft)
8	For new case go to step 2			

97 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBLA	21 11	
002	STO4	35 04	
003	RTN	24	
004	*LBLB	21 12	
005	STO3	35 03	
006	RTN	24	
007	*LBLC	21 13	
008	GSBD	23 14	
009	RCL4	36 04	
010	X^2	53	
011	.	-62	
012	2	02	
013	0	00	
014	5	05	
015	x	-35	
016	1	01	
017	+	-55	
018	÷	-24	
019	RCL5	36 05	
020	-	-45	
021	RCL3	36 03	
022	x	-35	
023	RCL5	36 05	
024	+	-55	
025	STO5	35 05	
026	RCL6	36 06	
027	-	-45	
028	RTN	24	
029	*LBLD	21 14	
030	2	02	
031	7	07	
032	3	03	
033	.	-62	
034	1	01	
035	5	05	
036	STO6	35 06	
037	+	-55	
038	STO5	35 05	
039	RTN	24	
040	*LBLE	21 15	
041	6	06	
042	.	-62	
043	8	08	
044	7	07	
045	9	09	
046	EEX	-23	
047	CHS	-22	
048	6	06	
049	x	-35	
050	CHS	-22	
051	1	01	
052	+	-55	
053	5	05	
054	.	-62	
055	2	02	
056	5	05	
057	6	06	
058	Y^X	31	
059	RCL6	36 06	
060	1	01	
061	5	05	
062	+	-55	
063	x	-35	
064	RCL5	36 05	
065	÷	-24	
066	.	-62	
067	2	02	
068	3	03	
069	5	05	
070	Y^X	31	
071	CHS	-22	
072	1	01	
073	+	-55	
074	1	01	
075	4	04	
076	5	05	
077	3	03	
078	6	06	
079	6	06	
080	x	-35	
081	RTN	24	
090			
110			

LABELS

A M	B C_T	C IT	D T	E PALT
a	b	c	d	e
0	1	2	3	4
5	6	7	8	9

FLAGS	SET STATUS FLAGS ON	OFF	TRIG	DISP
0	0 ☐	☒	DEG ☒	FIX ☒
1	1 ☐	☒	GRAD ☐	SCI ☐
2	2 ☐	☒	RAD ☐	ENG ☐
3	3 ☐	☒		n 2

REGISTERS

0	1	2	3 C_T	4 M	5 T(K)	6 273.15	7	8	9
S0	S1	S2	S3	S4	S5	S6	S7	S8	S9
A	B	C	D	E	I				

Program Description I

Program Title Lowest Usable Flight Level

Contributor's Name Hewlett-Packard Company, HP-67/97 Users' Library

Address 1000 N. E. Circle Boulevard

City Corvallis **State** OR **Zip Code** 97330

Program Description, Equations, Variables This program computes the lowest usable flight level for aircraft flying above 18,000 feet mean sea level (MSL) from the current altimeter setting.

For flights operating at altitudes in excess of 18,000 feet the altimeter is set at 29.92 and aircraft are assigned flight levels. In order to avoid overlapping flight levels with true altitude above sea level, the lowest usable flight level is found at which a setting of 29.92 will place the aircraft above 18,000 feet MSL.

The lowest usable flight level is 18,000 feet if the altimeter setting is greater than or equal to 29.92 inches of mercury (Hg).

For altimeter settings below 29.92

$$\text{LUFL} = 18{,}000 + 500 \times \text{INT}\,(60.82 - 2 \times \text{ASET})$$

where

ASET = altimeter setting

INT = integer function

Operating Limits and Warnings

Program Description II

Sketch(es)

Sample Problem(s) For the following altimeter settings, find the lowest usable flight level.

ASET	ANSWER
29.92	18,000
29.55	18,500
28.45	19,500

Solution(s)

Keystrokes:	See Displayed:
29.92 [B] [C]	18000
29.55 [B] [C]	18500
28.45 [B] [C]	19500

Reference(s)

This program is a direct translation of a program from the HP-65 <u>Aviation Pac</u>.

User Instructions

1				2
INITIALIZE	ASET	CALCULATE	RECALL	

STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS		OUTPUT DATA/UNITS
1	Enter program				
2	Initialize		A		0.00
3	Input altimeter setting	In Hg	B		in Hg
4	Calculate lowest usable flight level		C		LUFL (ft)
5	For new case go to step 3				
6	To recall altimeter setting		D		in Hg

97 Program Listing I

STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBLA	21 11	
002	CLX	-51	
003	STO8	35 08	
004	RTN	24	
005	*LBLB	21 12	
006	STO8	35 08	
007	RTN	24	
008	*LBLD	21 14	
009	RCL8	36 08	
010	RTN	24	
011	*LBLC	21 13	
012	2	02	
013	9	09	
014	.	-62	
015	9	09	
016	2	02	
017	RCL8	36 08	
018	X>Y?	16-34	
019	X⇄Y	-41	
020	ENT↑	-21	
021	+	-55	
022	6	06	
023	0	00	
024	.	-62	
025	8	08	
026	2	02	
027	X⇄Y	-41	
028	-	-45	
029	INT	16 34	
030	5	05	
031	0	00	
032	0	00	
033	x	-35	
034	1	01	
035	8	08	
036	EEX	-23	
037	3	03	
038	+	-55	
039	RTN	24	

SET STATUS

FLAGS	ON	OFF
0	☐	☒
1	☐	☒
2	☐	☒
3	☐	☒

TRIG	
DEG	☒
GRAD	☐
RAD	☐

DISP	
FIX	☒
SCI	☐
ENG	☐
n	2

LABELS

A	B	C	D	E
INITIALIZE	ASET	RCL ASET	→LUFL	

REGISTERS

8
ALT SET

NOTES

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