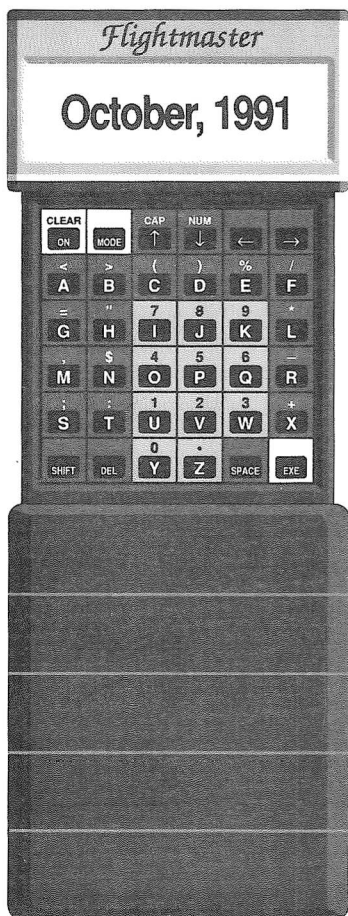


# Flying with

# Flightmaster<sup>TM</sup>

The latest news, tips and techniques for owners of the Flightmaster handheld flight management system.



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## What's New?

### Missing Summer 1991 *FwF*?

No, you didn't miss an issue of *Flying with Flightmaster*. Yes, the issue prior to this one was March 1991!

Our apologies. We try to publish *FwF* on a quarterly schedule (approximately), but somehow the rigors of exhibiting at Oshkosh and other seasonal summertime responsibilities plus several record-breaking months of *Flightmaster* sales overwhelmed our staff, and so the summer '91 issue of *FwF* never made it to press.

We'll try not to let it happen again.

### Flightmaster at AOPA Expo

Flightmaster will be exhibiting at the AOPA Expo in New Orleans on October 22-26, 1991. If you're attending the Expo, please do stop by the Flightmaster booth and say hello. And bring your pilot friends...we'll be offering a special discount on Flightmasters purchased at the Expo!

### NOS Now Provides FM Airway Data

The Flightmaster database of airports, nav aids, fixes and airways has historically been derived from magnetic tapes that we obtain every eight weeks from the FAA National Flight Data Center in Oklahoma City. We perform our own quality assurance procedures on these tapes, then extract and compress the data and encode it on Flightmaster datapaks.

Although the FAA-provided airport, nav aid and fix data has always been in

good shape, we have had serious difficulties with the airways data. The FAA airways tapes seem to be riddled with errors. (If you've ever wondered why database LORANs don't include airways, or why many of the PC-based flight planning programs have trouble with airway turnpoints, this is probably the reason.) The errors in the FAA airways data required us to perform extensive cross-checks and corrections during every eight week revision cycle.

Our primary source of accurate airways data has been a publication called the Digital Aeronautical Chart Supplement (DACS) that is published by NOS/NOAA every eight weeks. Unfortunately, the DACS was available only in printed form, not in machine-readable form. So we were forced to cross-check the FAA airway tapes against the printed DACS manually, and to make the necessary corrections manually. With 850 airways and 13,000 airway segments to check, this has been a real nightmare!

Now all that has changed. At long last, NOS has started providing us with the DACS on magnetic tape. Starting with the revision cycle of July 25, 1991, the FM airways database is being derived directly from the NOS data, which we have found to be far more accurate than the FAA-provided airways data.

What this means to you is: (1) FM airways data will be even more accurate than before, and (2) FM updates will be available a bit earlier than before.

## Free Updates!

As a Flightmaster owner, you probably can't resist showing off your FM to your pilot friends, right? But did you know that such demos can earn you free FM updates?

Although Flightmaster Inc. advertises in the *AOPA Pilot* and *Wide World of Flying* and via direct mail, our most important advertising comes from enthusiastic word-of-mouth recommendations of customers like you. We need your help!

You can help us immensely by demonstrating your Flightmaster one-on-one to your pilot friends and flight instructors, and by arranging to show the Flightmaster video at flying club meetings, safety seminars, and other aviation-oriented get-togethers. And we want to make it worth your while.

We do this by means of our Referral Update Credit Program. In a nutshell, it means that each time a new Flightmaster is purchased as a direct result of your efforts, you are entitled to credit for one free database and software update for your Flightmaster...a \$50 value. Each pilot who purchases a Flightmaster as a result of your referral also receives a free update, which is his incentive to document the referral.

In order for you to receive your update credit, each pilot who purchases a new Flightmaster must tell us that you referred him *and give us your Flightmaster serial number* at the time he places his order. If he does this, both he and you will receive credits for one free update each.

If you show off your Flightmaster a lot, you might easily be able to keep your Flightmaster updated every eight weeks and never spend a dime!

## Database Update Schedule

Here's the calendar of FAA database revision dates for the next 12 months:

- November 14, 1991
- January 9, 1992
- March 5
- April 30
- June 25
- August 20

We suggest that VFR pilots update their FM datapaks at least twice a year (same as sectional charts), and that IFR pilots update every eight weeks.

When you ship your datapaks for updating, be sure to package them securely (preferably in bubble wrap) and insure them for \$300. Be sure to include your full name, address, daytime phone, and (very important) your Flightmaster serial number. If you are not an update subscriber, include a check or credit card number to cover your one-time update.

Unless you have purchased the "zero downtime" spare paks, returning your datapaks for updating means that you will be without the use of your Flightmaster while your datapaks are in-transit. We understand that you don't want to be "down" for long, so we try our best to turn around all updates within 24 hours. In fact, we often send updates out the same day they arrive. We ship the paks back to you via UPS air, either second-day or overnight.

## Printing W&B and Such

We've received quite a few calls from Part 135 operators asking whether it is possible to get hardcopy printouts of Flightmaster's weight-and-balance calculations using the docking thermal Printer II accessory. The answer is: yes.

### Keyboard Commands for Printer II

You can print hardcopy of W&B results (or any Flightmaster display) on your Printer II by using the following keyboard command:

- Hold down the **SHIFT** key, then
- Press the left-arrow key (**←**)

Pressing **SHIFT+←** causes the the contents of the Flightmaster display to be printed as two lines of hardcopy on the Printer II.

To advance the paper, simply press **SHIFT+SPACE**. Each time you do so, the printer will advance the paper by three lines.

### Printing W&B Results

Suppose you need a printout of a takeoff weight and CG for your Part 135 load manifest. Simply work the W&B calculation on your FM in the usual way. Then bring up the takeoff weight display:

```
TAKEOFF WEIGHT
WtOK CgOK 10305
```

and press **SHIFT+←** to print the screen. Now press **MODE** twice to display the takeoff CG screen:

```
C.G. = 249.08
[248.71, 255.9]
```

and once again press **SHIFT+←** to print the screen. Finally, press **SHIFT+SPACE** a couple of times to advance the paper, and tear off your hardcopy.

## Printing a Complete W&B

You can use the same technique to print out an entire W&B calculation. Simply start at the initial W&B item (basic empty weight) and step through the W&B item-by-item, using **SHIFT+←** to print each screen in sequence:

```
BASIC EMPTY WT.
6650
crew seats 1+2
340
pax seats 3+4
400
pax seats 5+6
340
nose baggage
175
aft baggage
400
ZERO FUEL WEIGHT
WtOK 8305
fuel load (lbs)
2000
RAMP WEIGHT
WtOK 10305
less taxi fuel
150
TAKEOFF WEIGHT
WtOK CgOK 10155
C.G. = 249.08
[248.71, 255.9]
less fuel burn
1500
LANDING WEIGHT
WtOK CgOK 8655
C.G. = 247.90
[247.47, 255.9]
```

### VERY IMPORTANT!

For these keyboard commands to work, the Printer II driver software must be loaded into FM's memory. This happens whenever you start-up the AVIATION program with the FM is docked with the printer, or when you use FM's **Print** function to print a trip log or flight plan. The Printer II driver requires about 2.5K of internal memory space, and if there isn't enough space you will get an **OUT OF MEMORY** message.

## Questions & Answers

*Every day, we answer lots of technical questions from Flightmaster users. Here are some interesting ones we've received recently.*

### Bad Batteries

**"Recently, I put a new battery in my FM, and it failed immediately...I got a low-battery message the first time I selected 'View'. I tried a second battery with the same result. I bought two more batteries at the same store and had the same problem. These batteries were Eveready and Ray-O-Vac brand names, marked 'heavy duty' or 'extended life' but not 'alkaline'.**

**"Finally, I bought some Duracell alkalines (as recommended in the FM manual) and those were A-OK. Can FM really tell the difference between Duracells and other batteries?"**

No, Flightmaster cannot tell the difference between Duracells and other brands, or between alkalines and other types. You must have gotten four bad batteries in a row, as unlikely as that may seem.

"Heavy duty" and "extended life" batteries are zinc-carbon batteries, not alkalines. Zinc-carbon batteries have poorer shelf-lives than alkalines do. Zinc-carbon batteries are normally not date-coded (the way Duracells and other top-notch brands of alkaline batteries are), so it's impossible to tell how old the batteries are before you buy them. And zinc-carbon batteries (even the "heavy duty" variety) have far shorter operating lives than alkalines.

For all these reasons, we strongly urge FM owners to use nothing but fresh, date-coded, top-quality alkaline batteries such as Mallory Duracells and Eveready Energizers. Try to buy batteries from a high-volume retailer and check the date codes to make sure you're not getting old ones that have been sitting on the shelf for months. If possible, use a battery tester or voltmeter to test the batteries before you purchase them.

When it comes to something as serious as aviation, trying to save a few pennies on batteries just doesn't make sense.

### Trap Messages

**"I was updating my FM to the new version datapaks when I got the message 'TRAP' on the display. I've tried pressing ON/CLEAR and every other key I can think of, but can't get rid of the message. Where's the 'reset' button on this thing? Help!"**

Bad news. The "TRAP" message means that your FM's microprocessor has gone berserk and needs to be reset. You can accomplish this by removing the battery and then pressing ON/CLEAR. Unfortunately, this will cold-start the machine and result in the loss of all user-entered data in FM's internal memory. You'll have to restore that from a backup disk or RAMpack if you have one, or re-enter it all by hand if you don't. You'll also have to reset the date and time.

TRAPs are almost always caused by removing or inserting a datapak or accessory (CommsLink, Printer, etc.) from the FM while the machine is switched on. This is an extremely risky procedure and should be carefully avoided.

## Altitude Changes Enroute

**“When given an altitude change enroute, does revising the altitude in the FM cause change to take effect at PP with the associated climb or descent worked out?”**

No, FM isn't quite that smart. If you use **Route**→**Change** or **Route**→**Xpand** to amend your altitude and winds enroute, FM does not do climb or descent calculations from your PP. It *does* recalculate your leg times and fuel burns based on the new altitude and winds, starting with the last-crossed fix. In practice, the results are almost always “close enough.” But if you want even more accuracy, try this:

- climb or descend to the new altitude;
- use **Route**→**Xpand** to insert a “PP” at the appropriate place in your route, and to amend altitude and winds;
- use **View** to recalculate your trip log.

Using this procedure, the new ground-speed and fuel burn will take effect starting with the PP fix.

## Flight Plan Routes

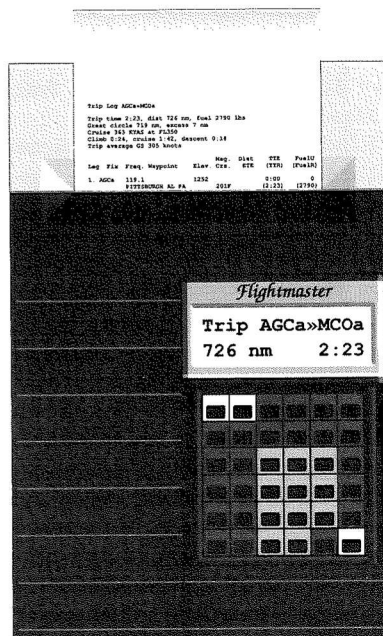
**“Is there a way to carry the unexpanded routing over to the flight plan form? A simple ‘BSY V3 FAY’ results in a long string of VORs that’s a pain to read to FSS.”**

If your route includes airways and/or RNAV fixes and you select the **FlightPlan**→**New** function to create an FAA flight plan form, FM asks you whether or not you want to expand the airways and whether or not you want to include the RNAV fixes. By responding **Y** or **N** to these questions, you can determine how long-winded the route on the flight plan form will be. Naturally, you can also edit the flight plan route to delete unneeded items.

## Charging the Printer II Battery

**“The rechargeable battery in my accessory Printer II seems to run down much sooner than it used to. How do I replace it?”**

In all likelihood, your Printer II's rechargeable nickel-cadmium battery doesn't need to be replaced. If you repetitively recharge such a “nicad” battery without first allowing it to discharge fully, soon it will not accept a full charge. This phenomenon is known as “charge memory” and affects all rechargeable batteries of this type.



The common practice of keeping your Printer II plugged into its wall charger all the time will accelerate this problem. The solution is to let your Printer II battery discharge completely before recharging it. If you cannot do this all the time, at least make a practice of fully discharging the battery every few weeks.

## Weight-and-Balance

(This article originally appeared in FwF two years ago, but that issue is out-of-print any many FM owners have not had the opportunity to read it.)

Quite a few Flightmaster owners have encountered difficulty setting up the W&B templates for their aircraft. In most cases, this has occurred with older aircraft that have pre-GAMA-format POHs that give moment rather than arm data. Since the Flightmaster requires arm data (not moment), this can be very confusing, and requires some extra steps to convert the moment data to arm data.

To illustrate exactly what's involved, let's go through the process of creating a Flightmaster W&B template for a 1972 model Cessna 172 Skyhawk, step by step. This aircraft has one of the older-style POHs.

### Basic Empty Weight

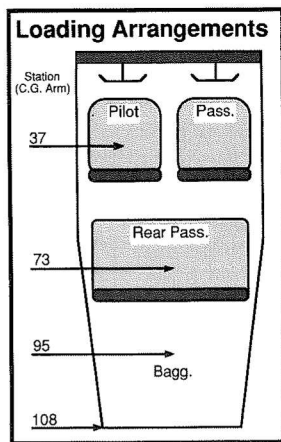
The basic empty weight for our aircraft comes from either the manufacturer's "Weight and Balance Data Sheet", or from changes noted on FAA Form 337 if equipment has been added, changed or removed since manufacture. In either case, the aircraft W&B documents give us three figures:

**Licensed Empty Weight:** 1,382 pounds  
**C.G. Arm:** 37.9 inches (aft of datum)  
**Moment:** 52,377.8 pound-inches

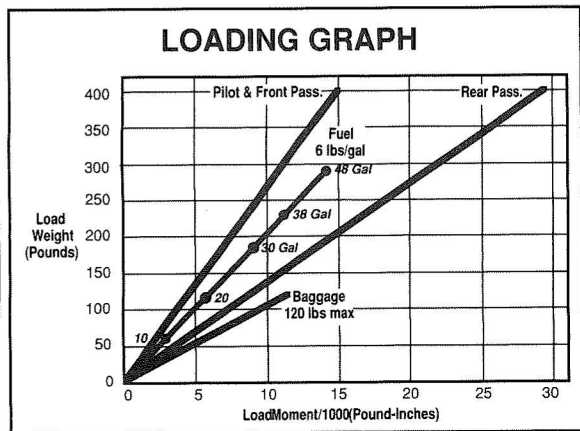
We can ignore the moment figure, and enter the weight and CG arm figures (1,382 lbs. and 37.9 in.) into the top line of our Flightmaster W&B Template Worksheet.

## Load Stations

Now we need min/mid/max weights and CG arms for each aircraft load station (fuel, seats, baggage, etc.) The load station data must be obtained from the W&B section of the POH. Unfortunately, this information is a bit obscure in our old-style POH. We find one diagram that looks like this:



and a load graph that looks like this:



Now let's see...do we have the weight and CG information that we need? Well, for the front seats, the loading diagram shows an arm of 37 inches, and the loading graph shows min and max weights of zero and 400 pounds. Fine. We'll use 200 pounds for the mid weight.

Similarly, the rear seats have an arm of 73 inches, and min/mid/max weights of 0/200/400 pounds. And the baggage area has an arm of 95 inches and min/mid/max weights of 0/60/120 pounds. So far, so good.

### Fuel & Oil CG

But what about the fuel tanks? Its CG arm does not show up anywhere in the POH, so we have to calculate it. If we pick a point on the "fuel" line on the loading graph...let's pick full long-range tanks at 48 gallons, for example...we can see that this point corresponds to a weight of 288 pounds, and a moment of about 13,750 pound-inches.

We can calculate the CG arm of the fuel by dividing the moment by the weight. 13,775 pound-inches divided by 288 pounds gives us a CG arm of 47.8 inches.

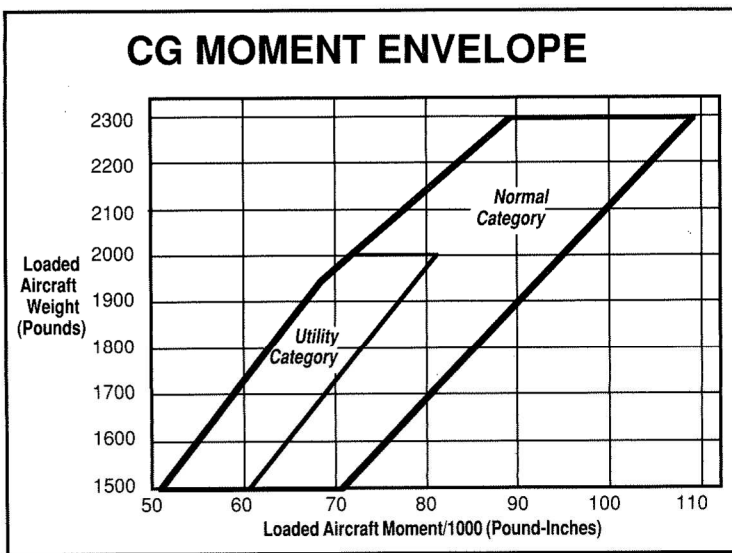
Just to double-check our work, let's pick another point on the loading graph "fuel" line...38 gallons (full standard tanks) this time. The graph shows 228 pounds and 10,900 pound-inches. Calculating, 10,900 divided by 228 gives us a CG arm of 47.8 inches

once again. Good! That's the CG figure we'll use in our W&B template.

How about engine oil? Well, there's a little footnote to the loading graph which says: "Engine Oil: 8 qts = 15 lbs. at -0.2 moment/1000, may be assumed for all flights." Okay, let's see: -0.2 times 1,000 is -200 pound-inches (moment). -200 pound-inches divided by 15 pounds gives a CG arm of -13.33 inches. (The minus signifies a CG forward of the datum plane.) So that's the arm we'll use for the oil item on our W&B template.

### Normal Category CG Envelope

Now let's look at the CG envelope:



Unfortunately, Cessna's old POH format provides only a "CG moment envelope" so we have to calculate the "CG arm envelope" for ourselves. To do this, we locate each "corner" of the moment envelope and calculate the CG arm by dividing the moment by the weight (just as before).



The upper righthand corner of the Normal Category moment envelope, for example, is at 2300 pounds and 109,000 pound-inches. Dividing 109,000 by 2300 gives a CG arm of 47.4 inches.

Likewise, the upper lefthand corner of the Normal Category moment envelope is at 2300 pounds and 88,500 pound-inches. Dividing 88,500 by 2300 gives a CG arm of 38.5 inches.

We must do this same calculation for each "corner" point of the moment envelope in order to derive the complete arm envelope that we need for the Flightmaster W&B template.

### Utility Category CG Envelope

The Cessna 172 is also certificated for operation in the Utility Category as long as gross weight does not exceed 2,000 pounds and CG remains within a more-restrictive Utility Category envelope.

The airplane is approved for spins when operated in Utility Category, but not in Normal Category.

We can set up a special Utility Category calc entry with a max weight of 2,000 pounds. This must be followed by a special Utility Category envelope description, derived from the moment envelope just as we did for the Normal Category envelope.

### W&B Template

Finally(!) we have all the data we need to complete the W&B Template Worksheet and set up the W&B template in the Flightmaster.

As you can see, setting up a W&B template using an older-style moment-oriented POH can be quite a bit of work. There's one bit of good news, though...you only have to go through this agony once. From then on, the Flightmaster makes W&B a snap.

Entry Type	Title	Item Entries Only							Calc Entries Only			Envelope Entries Only		
		Multiplier	MaxVal	MaxCG	MinVal	MinCG	MidVal	MidCG	MaxWt	MinWt	Check CG?	@Wt	MinCG	MaxCG
Item	BASIC EMPTY WT.	1	1382	37.9	1382									
Item	fuel (gal)	6	48	47.8	10	47.8	38	47.8						
Item	eng oil (qt)	1.875	8	-13.33	6	-13.33	7	-13.33						
Item	pilot+front pass	1	400	37	0	37	200	37						
Item	rear pass	1	400	73	0	73	200	73						
Item	baggage	1	120	95	0	95	60	95						
CALC	NORMAL (2300)								2300	0	Y			
Envelope												1500	34.7	47.4
Envelope												1950	34.7	47.4
Envelope												2300	38.5	47.4
CALC	UTILITY (2000)								2000	0	Y			
Envelope												1500	34.7	40.5
Envelope												1950	34.7	40.5
Envelope												2000	35.5	40.5

## Software Revisions

Here is a summary of the revision history of Flightmaster software, showing the bug-fixes, enhancements, and database revisions that have been incorporated into each successive update. Scheduled updates are released every eight weeks to coincide with the FAA database revision cycle.

We recommend a Flightmaster database subscription for all active IFR pilots, because there are usually substantial airway structure changes in every revision cycle. VFR pilots should update their Flightmaster twice a year, the same frequency with which their sectional charts are updated.

### v2.10 19-Sep-91

Database updated to FAA 19-Sep-91 revision cycle.

### v2.091 26-Aug-91

Add missing turnpoints 25-Jul-91 airways database. Changes allow FM to be configured as a 256K pak. Repackaged database/trig functions in one module. Minor speed-ups in database and trig functions.

### v2.09 25-Jul-91

Database updated to FAA 25-Jul-91 revision cycle. Airway database source changed from FAA to NOS. Corrected logic error in AutoAirway routing. Trip log summary "Avg GS" recalcd as ATAs entered.

### v2.08 30-May-91

Database updated to FAA 30-May-91 revision cycle. Added magnetic heading to printed trip log.

### v2.07 04-Apr-91

Database updated to FAA 04-Apr-91 revision cycle.

### v2.06 07-Feb-91

Database updated to FAA 07-Feb-91 revision cycle.

### v2.05 13-Dec-90

Database updated to FAA 13-Dec-90 revision cycle. Allow lat/lon entry to tenths of minutes.

### v2.04 18-Oct-90

Database updated to FAA 18-Oct-90 revision cycle. Correct sequence of items displayed in View col D.

### v2.031 10-Sep-90

Corrected AutoRNAV error introduced in v2.03. Corrected default temp for Route→??? OAT prompt.

### v2.03 23-Aug-90

Database updated to FAA 23-Aug-90 revision cycle. Corrected trig in AutoRNAV waypoint positioning. Added "Heading" display to View column D. Added climb/descent mileage to View trip summary. Improved selection of initial/final AutoV/R fixes. Enhanced accuracy of density altitude calculations. Reduced Database→Wpt search radius to 50 nm.

### v2.02 28-Jun-90

Database updated to FAA 28-Jun-90 revision cycle. Backup via CommsLink now sets 9600-8-N-1-XON. Fixed "INTEGER OVERFLOW" error in Quick. Fixed bad OAT when exiting/reentering AVIATION.

### v2.01 28-Apr-90

Database updated to FAA 03-May-90 revision cycle. Improved AutoV/AutoR navaid selection algorithm. Improved AutoR waypoint calculation on N-S routes. Eliminated roundoff error in density altitude calcs. Fixed bug in "nested" Database→Search. E6B→UnkownWind: fixed wind direction calc error. W&B: fixed DIVIDE BY ZERO error.

### v2.00 15-Mar-90

Database updated to FAA 08-Mar-90 revision cycle. New universal location parser accepts 6 formats:

- Fix identifier: KLAX
- Fix-radial-distance: ICT330018
- Intxn of two radials: LAX316/VNY240
- Lat/lon: 3530/12715 or N3530/W12715
- Asterisk-prefixed name fragment: \*PITTS
- Estimated present position: PP

Estimated present position referenced by "PP". View: spreadsheet reorganized into six columns. View: added dist-to-fix, airway, elev., full-route. Route→New/Change: correct performance for OAT. Route→New/Change: accept 4- or 5-digit winds. Airport database includes runway length & ILS info.

### v1.06 24-Jan-90

Database updated to FAA 11-Jan-90 revision cycle. Route→New/Change: diagnose "Too many winds". View: diagnose "No route".

### v1.05 24-Nov-89

Database updated to FAA 16-Nov-89 revision cycle. Enhanced VOR/RNAV auto-routing for longer legs. Changed VL and RL to use shorter legs. Fixed retention of trip ATAs afterRoute→Change. Added "Free Memory" display to Setup→Checklist. Enhanced precision of fuel figures on trip log. Fixed CommsLink→Restore bug affecting Macs. Fixed roundoff bug in lat/lon display. Fixed roundoff bug in fuel-remaining on printed log.

# Ordering Information

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## Updates

- Annual (6x) update subscription via 2nd-day air .....\$150  
*The Flightmaster database is updated every 8 weeks with revised airport, airway and navaid data from the FAA flight data center. This subscription covers your next six updates. We send you a reminder card when each update is available. You ship us your two datapaks, we reprogram them with the latest updated database and software revision, and ship them back to you via 2nd-day air. (You need not get every revision, as long as you take at least two per year.)*
- Annual (6x) update subscription via next-day air .....\$180  
*Same as above, except we ship your updates by next-day air. This provides one less day of downtime.*
- Zero-downtime update option .....\$200  
*We provide a pair of extra datapaks for you so that you can receive database updates without any downtime whatsoever. This one-time-only price covers only the two extra datapaks... you must also purchase an update subscription.*
- One-time update via 2nd-day air .....\$50  
*Ship us your two datapaks at any time, we reprogram them with the latest updated database and software revision, and ship them back to you via 2nd-day air. Add \$5 more for shipment by next-day air.*

## Accessories

- RS232 comms link .....\$100  
*Enables your Flightmaster to communicate with a PC or Macintosh, modem, serial printer, or any other device with a serial port. Includes software to backup user-defined data to disk: specify MS-DOS or Mac.*
- RS232 adapters .....\$20  
*Used with Comms Link to change its DB25F connector to whatever is necessary. Specify which of the following adapters you need: IBM AT, Mac+, Mac SE or II, serial printer, or modem.*
- Fitted leather case .....\$30  
*Made of soft black glove leather with Velcro flap. Keeps your Flightmaster looking new.*
- 32K RAMPAK .....\$90  
*The most convenient way to back up your Flightmaster data.*
- AC adapter .....\$20  
*Lets you power your Flightmaster from a 120-volt AC electrical outlet.*
- Printer II .....\$350  
*Compact "docking" thermal printer for your Flightmaster.*
- Thermal paper for Printer II .....\$20  
*Package of four rolls.*

## Video Information Package

- Video information package with manual .....\$15  
*Detailed 30-minute VHS videocassette which demonstrates the many features of the Flightmaster, explains how it is used in a wide variety of pre-flight and in-flight situations, and shows the various accessories available. Also includes the complete 75-page Flightmaster User's Guide. The \$15 cost for this package is credited toward your purchase of a Flightmaster.*

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