Flying with Flightmaster™

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

May, 1990

In this issue...

What's New?

Late-breaking news items of interest to Flightmaster owners...

New v2.0 User's Guide

A newly revised and expanded edition of the *Flightmaster User's Guide* is now available.

A major series of enhancements to Flightmaster's software, version 2.00, was released in March. As an interim step, the principal differences between the new version and its predecessors were detailed in the last issue of *Flying with Flightmaster* (Feb. '90).

The new version 2.0 edition of the *User's Guide* incorporates all of the version 2 software enhancements. Certain sections of the manual that seemed to be generating some confusion have been rewritten. The "Hints and Kinks" chapter has been greatly expanded to incorporate many of the articles, tips and techniques discussed in prior issues of the *Flying with Flightmaster* newsletter. A new chapter has been added to explain the various non-aviation-oriented capabilities of the PSION Organiser, such as the personal information database, appointment calendar, and alarm clock systems.

The revised *User's Guide* has grown by one-third, from 75 to 100 pages. The new manual is phototypeset (the old one was laser printed), the graphics and illustrations have been greatly improved, and the cover is now in full color. All in all, we think you'll really notice the improvement.

Recent Flightmaster purchasers who received a unit with v2.0x software but v1.0 documentation should have received the new *User's Guide* automatically by now. (Please let us know right away if you haven't.)

All other Flightmaster owners can receive the new manual free-of-charge by ordering a new software/database update *by June 28th at the latest.* After June 28th, you will have to purchase the new manual at a cost of $15.00 plus shipping. So if you're not presently an annual update subscriber, you'll want to be sure to order either a subscription or a one-time update for your Flightmaster by the June 28th deadline.
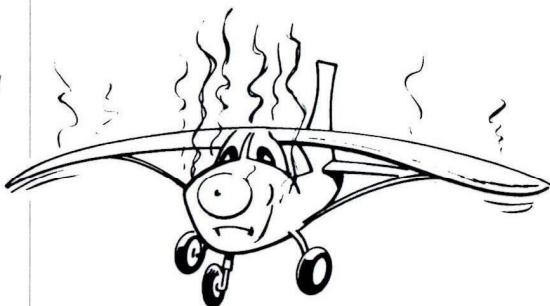
Visit Flightmaster at Oshkosh

If you plan to be one of the 800,000-odd attendees at this year's giant Experimental Aircraft Association Fly-In Convention being held at Oshkosh, Wisconsin, on July 28th through August 2nd, be sure to visit the Flightmaster booth in the south exhibit hall.

You'll get to chat face-to-face with Flightmaster president Richard Wilkes, developer Mike Busch, and other key members of the Flightmaster product development and support team. We'll be announcing and demonstrating several exciting new additions to the Flightmaster product line that you won't want to miss. We'll also be conducting Flightmaster seminars, and offering special discount prices on Flightmasters and accessories purchased at the show. Please be sure to stop by the booth and introduce yourself.

CommsLink Hints

Having problems using your CommsLink RS232 communications accessory? Here are a few suggestions for helping you to avoid the most common pitfalls.

Plugging and unplugging

Whenever you plug your Comms-Link into the top slot of your Flightmaster, make sure that the FM is switched off. Use the same precaution whenever you unplug your Comms-Link. If you plug/unplug the Comms-Link while the FM is switched on, it is possible—uncommon but possible—for you to crash the FM's operating system. If this happens, you'll have to remove the battery to cold-start the machine, and you will lose all your user-entered data. Switch the FM off!

When using the CommsLink to connect your FM to a personal computer, be sure to plug the CommsLink into the FM first (making sure it is off), and then plug the CommsLink's RS232 cable into the PC. When disconnecting, reverse the procedure: unplug the CommsLink from the PC first, then unplug the CommsLink from the FM (again making sure it's off). In other words, never plug/unplug CommsLink into FM when there's anything connected to the other end of the cable.

Printing through your PC or Mac

To capture a FM-generated trip log or flight plan on PC disk, you must use a general-purpose communications program on your PC. *Don't try to use CL.EXE (MSDOS) or Comms_Link (Macintosh)...these are used only in conjunction with the Backup/Restore functions of the Flightmaster!*

There are lots of suitable communications programs available, both commercial and shareware. Popular choices for MSDOS machines include Crosstalk, ProComm, and Telix. For Macintoshes, popular programs include MacTerminal, Microphone, and Red Ryder/White Knight. But any general-purpose comm program will do.

Be sure to set up your communications program for 9600 baud, 8 data bits, no parity, and 1 stop bit. Then put your program in "capture" mode, connect the FM/CommsLink to the appropriate RS232 port (you may need an adapter cable available from Flightmaster), and select the Print function from the Flightmaster's aviation menu.

Recovering from lockups

When backing up, restoring, or printing to a PC using the CommsLink, the Flightmaster will occasionally appear to lock up. This is usually due to incompatible baud-rate settings at the Flightmaster and PC ends, although it may be due to improper hookup or other factors as well. In the event of such a lockup, here's what to do.

First, try pressing ON/CLEAR on the Flightmaster keyboard.

If that doesn't work, try removing the CommsLink's RS232 cable from the PC. Then wait for a minute or so and the FM will probably time-out and give you an error message.

If that doesn't work, try removing the CommsLink from the FM (even though you can't switch the FM off...we're getting desperate here). Again, wait awhile to see if the FM times out with an error message.

If all of these steps fail, you will probably have to cold-start the machine by removing the battery momentarily. This is the last resort, because it will cause all your user-entered data to be lost from the Flightmaster's memory. (Hopefully, you're backed up.)

Flying Direct Without RNAV

We've always considered Flightmaster to be the ideal companion for RNAV equipment, since it makes the process of plotting waypoints along a direct route so automatic and painless. Recently, though, we've started hearing from some inventive Flightmaster owners who are using their FMs to fly direct routes without RNAV equipment...in some cases, using nothing more than a single VOR receiver plus a FM.

While we don't want to imply that the Flightmaster is an adequate substitute for RNAV or LORAN—these techniques involve additional pilot workload and are not approved for IFR—we thought you might find them interesting.

Even if your aircraft has both RNAV and LORAN C gear on its panel, you might just file away these techniques for the day that you run into an avionics failure and have to limp home with minimal navigation equipment.

The basic method...

Suppose we want to fly direct from 2G4 (Oakland MD, Garrett County Airport) direct to JGG (Williamsburg VA Airport) with just a single VOR receiver and a Flightmaster, nothing more. Flightmaster's Quick function tells us that 2G4a→JGGa is 146° magnetic, 187 nm, and will take us 1:23 in our Skylane if we average 135 knots groundspeed. Okay, so we depart 2G4 heading 146°...fine. But how can we tell if we're staying on-course?

Here's one way. First we use Quick once again, but with the departure and destination airports reversed: JGGa→2G4a is 329° magnetic. This tells us that to remain on-course, we need to stay on the 329° "radial" of JGG airport. (Never mind that JGG isn't a navaid. It's okay.) Let's write that down: we need to stay on the JGG 329° "radial".

Ten minutes after takeoff, we decide that it's time to check our position. We tune in the nearby Kessel VOR, and determine that we're on the ESL 342° radial. Since we have no DME, we take a cross-bearing off another nearby VOR, Grantsville, and determine that we're on the GRV 185° radial. So...how do we tell if we're on-course or not? Easy! We use the Quick function once again as follows:

```
From: JGG
To:   ESL342/GRV185
GS (kts): 135

Quick JGGa→ESLw
329°   166nm 1:14
```

This shows us that our present position is on the JGG 329° "radial" (exactly on-course!), and we're about 166 nm and 1:14 flying time from our destination. So far, so good.

Roughly ten minutes later, we check our position once again. Using our single VOR receiver, we determine that we're on the Linden 300° radial and the Kessel 140° radial. Using Quick once again:

```
From: JGG
To:   LDN300/ESL140
GS (kts): 135

Quick JGGa→LDNw
328°   144nm 1:04
```

Now our present position is on the JGG 328° "radial" (one degree off), and we've got about 144 nm and 1:04 to go. Since we've drifted from the JGG 329°
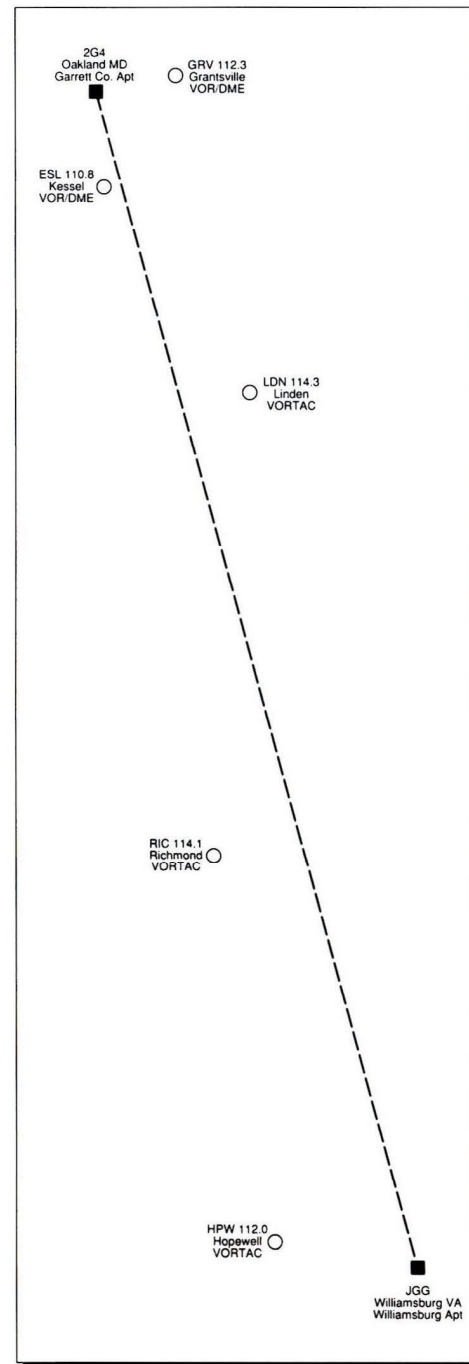
to the JGG 328°, we're very slightly to the right of course. It would probably be a good idea to adjust our heading a few degrees to the left and re-check our position in another ten minutes or so.

By continuing to use this procedure periodically throughout the flight, we can continue to monitor our position, and make any necessary heading corrections to remain on the JGG 329° radial.

Note: This technique makes use of Flightmaster features that were not available prior to the v2.00 software update. Make sure your FM software has been updated before you try this.

If we have DME...

...we can use the same basic technique, except that we can get a position fix by tuning in just one nearby VORTAC or VOR/DME and noting both the radial and distance. We don't need to get a cross-bearing from a second VOR, so it's a little less work.

Take the same 2G4→JGG flight discussed above, for example. A half-hour into the flight, we check our position using nearby Linden VORTAC, and find that we are on the Linden 200° radial, 9.5 DME out. Using Quick once more:

```
From: JGG
To:   LDN200009.5
GS (kts): 135

Quick JGGa→LDNw
330°   114nm 0:51
```

We are on the JGG 330° "radial" (one degree left of course this time). We need to correct our heading a few degrees to the right and re-check our position in awhile.

For long trips...

For long trips in excess of 150–200 nm, this method doesn't work very well. The problem is that the technique provides *angular* off-course displacement to the nearest degree measured from the destination. An *angular* displacement of one degree from the desired great-circle course is equivalent to a *linear* off-course distance of one nm for every 60 nm distance from the measurement point. Just as VOR navigation becomes less and less accurate as we get farther and farther from the station, the direct navigation technique illustrated so far becomes less accurate the farther we are from the destination point.

For trips up to 300 nm, we can modify the technique to navigate relative on the departure airport for the first half of the trip, and then navigate relative to the destination airport for the last half. Returning to our 2G4-JGG flight, we can start navigating on the 146° "radial" of 2G4 for the first part of the trip, then change to the 329° "radial" of JGG for the remainder. For example, when we checked our position 20 minutes into the flight and found ourselves on the Linden 300° radial and the Kessel 140° radial, we could have used Quick as follows:

```
From: 2G4
To: LDN300/ESL140
GS (kts): 135

Quick 2G4a→LDNw
148°    43nm 0:19
```

which shows that our position is on the 2G4 148° "radial," two degrees right of the desired 146° radial. We need to correct our heading to the left a bit to get back on-course.

Note that when using Quick to check our position using this technique, our present position is always entered as the "To:" fix, *never* as the "From:" fix. This is true whether we're navigating based on the departure airport or the destination airport.

For even longer trips, the solution to the accuracy problem is the same as the one we use with VOR navigation: break the trip up into acceptably-short legs over which the navigation technique works with acceptable accuracy. Fortunately, the automatic RNAV routing capability of the Flightmaster makes this fairly painless.

Returning to our 2G4→JGG flight, we can ask FM to plot an AutoRNAV route for us "2G4 R JGG" and it will come up with an intermediate waypoint defined as the Linden 230° radial, 10 DME. By referring to the trip log or using Quick, we know that we want to navigate via the 2G4 146°, then the LDN230010 324°, then the LDN230010 145°, and finally the JGG 329°. Actually, this 2G4→JGG example is not a sufficiently long trip to require using such an intermediate waypoint, but this illustrates the technique that can be used for trips of any length.

A different method...

If we use Flightmaster's in-flight progress monitoring feature by entering our takeoff time and fix-crossing times into the trip log as we fly, there's an entirely different technique we can use for navigating direct routes using just a single VOR receiver (with or without DME). This technique has the added advantage that it works well on both long and short trips, and can even deal with complicated routes that zig-zag around special-use airspace and such. Here's how it works.

First, we'll use Flightmaster's planning functions to come up with the desired route. We can use automatic RNAV routing, manual routing, or any kind of routing for that matter. We use the View function to ask Flightmaster to prepare a trip log. Then, when we depart, we press EXE-EXE to enter our takeoff time into the trip log.

At this point, Flightmaster's progress monitoring feature starts keeping track of where we *should* be based on our planned course and estimated groundspeed. We can refer to the position where FM thinks we *should* be using the special identifier "PP" (which stands for "present position").

Suppose that 20 minutes into the flight, we decide to check our actual position to determine whether we are on-course or not. As before, we use our VOR receiver to determine our radials from two nearby VOR stations, or alternatively use our VOR and DME to locate our radial and distance from one nearby VORTAC or VOR/DME station.

Now we use the Quick function to find the distance and bearing from where we actually are (the cross-radials or radial/distance) to where FM thinks we *ought to be* ("PP"):

```
From: LDN300/ESL140
To: PP
GS (kts):

Quick LDNw→L/L
160°    2nm
```

Assume the trip log shows our desired course to be 146° magnetic. FM has just told us that the place we *ought to be* is about 2 nm between our 12 and 1 o'clock position...ahead and a bit to the right. This tells us we're running a bit behind schedule, but just slightly left of course. On the other hand, if FM had said:

```
Quick LDNw→L/L
060°    2nm
```

we'd know that where we *ought to be* is about 2 nm at our 9 o'clock position... we have drifted significantly right of course and need to correct by turning toward the left.

Using this technique, we need to keep FM apprised about our present position. So whenever we pass an enroute waypoint or navaid, we need to inform FM by pressing EXE-EXE within the View function. To know when we've passed an enroute waypoint, we don't need RNAV equipment...it's sufficient to note when we cross the waypoint's radial (ignoring the distance component if we don't have DME).

Tips & Techniques

More usage tips from the experts to help you get the most from your Flightmaster.

Unnamed airway intersections

Occasionally, ATC will assign you a route that involves transitioning from one airway to another at a point where there is no named intersection charted. For example, a common tower-enroute routing in Southern California reads:

```
VNY V186 V363 V8 SLI SNA
```

Flightmaster cannot accept routings that involve two consecutive airway designators without a connecting intersection. Such a route must be entered into Flightmaster as a non-airway route with each turnpoint explicitly defined. For example, the above route can be entered as:

```
VNY POM164/PDZ276
PDZ238/POM164 SLI SNA
```

Before you resort to such tactics, make sure that the route actually doesn't have a charted intersection at the crossing of the airways. For instance, another common routing in Southern California is issued by ATC as:

```
VNY V186 V394 SLI SNA
```

but a look at the chart reveals that V186 and V394 intersect at a named intersection called ADAMM. Therefore, the route may be entered into Flightmaster as:

```
VNY V186 ADAMM V394 SLI SNA
```

Multiple performance profiles

Some users have asked whether FM is capable of planning flights for a particular aircraft at different power settings (such as 55%, 65%, and 75% power). You can accomplish this by defining several different performance profiles for the aircraft.

Since performance profiles are identified by the aircraft ID, you will have to give each performance profile a slightly different aircraft ID. If the aircraft involved is N2638X, for example, you might define three profiles under the identifiers A2638X, B2638X, and C2638X (for 55%, 65%, and 75% power, respectively).

Searching for fixes by name

Anytime you don't know the identifier for an airport or navaid, Flightmaster lets you enter an asterisk-prefixed fragment of the airport or navaid name. It then searches through its database and shows you all navaids and airports that match the specified name fragment, and lets you select the one you want.

*GNOSS

To use this feature most effectively, it is important for you to understand how airport and navaid names are derived in the Flightmaster database. The first thing you need to know is that names are limited to a maximum of 13 characters in length (due to the limited space in Flightmaster's datapaks).

Navaids are always known by their full official facility name. In almost all cases, the full name fits within the 13-character limit. In those rare cases where it doesn't, the name is truncated to 13 characters. Here are some examples:

JFK	KENNEDY	NY
LAX	LOS ANGELES	CA
TCS	TRUTH OR CONS	NM

Airport names are more difficult because airports often are better known by their city name (e.g., Wichita) than their facility name (e.g., Mid-Continent Airport). To make matters worse, airport names are often very long (e.g., John Fitzgerald Kennedy Airport). Flightmaster's database includes the city name of each airport, followed (if there's room) by as much of the facility name as possible within the 13-character limit. Words that frequently appear in airport names (e.g., airport, field, downtown, municipal) are abbreviated (e.g., apt, fld, dntn, muni) in order to make the 13-character limit more tolerable. Here are some examples:

KTUS	TUCSON INTL	AZ
KMKC	KS CITY DNTN	KS
KJFK	NEW YORK JOHN	NY
KICT	WICHITA MID C	KS
O56	NOVATO GNOSS	CA

If you can't seem to find the airport you want by name, try a shorter or different name fragment. If all else fails, start from a known nearby fix and use Database→Search.

Using the "R" key in View

When the View spreadsheet was reorganized as part of the v2.00 software update, a useful new feature was included that we neglected to document in the prior issue of Flying with Flightmaster. If you press the "R" key while within the View function, Flightmaster will display your entire expanded route (scrolling the display if it is too wide to fit). Pressing any non-arrow key will return to the normal spreadsheet display.

No more periods in routes

It used to be legal to punctuate Flightmaster route strings with periods instead of spaces. For example:

```
SMX..RZS.V386.FIM.V186.VNY..BUR
```

Starting with the v2.00 software update, this is no longer legal. Consequently, if you have saved routes that are punctuated with periods, you will need to revise them to be space-delimited and re-save them in this form.
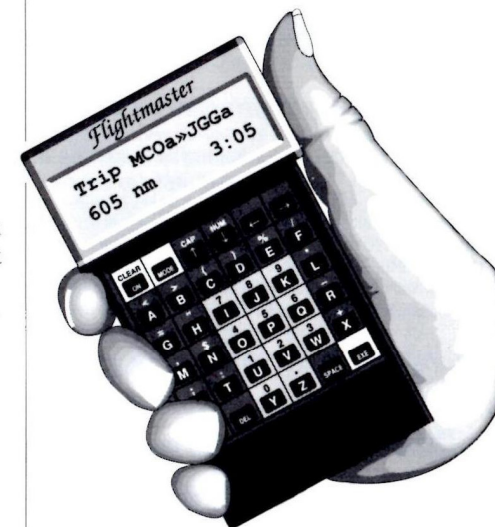
Software Revisions

The following summarizes the various versions of Flightmaster software, and the bug-fixes, enhancements, and database revisions that have been made in each subsequent update. Watch future issues of FwF to keep apprised of software and database changes as they become available. (Update subscription customers automatically receive a reminder card whenever a new update is available.)

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 after Route→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.

v1.04 29-Sep-89

Database updated to FAA 21-Sep-89 revision cycle.
Deleted duplicate VORs: CDR, CRO, LIB, SYA, TAL.
AVIATION does a device-boot at startup.
AVIATION does an escape-off on way out.
Warbling "beep" deleted...annoyed some users.
Print changed to 60 chars/line (from 80).
Fixed bug: divide-by-zero error on zero-length leg.
Fixed bug in retrieval of NDBs with 2-letter ids.
Fixed minor bug in checklist editor.
Fixed minor bug in Database→Def.
Fixed minor bug in route parsing.
Fixed minor bug in Quick display.
Enhanced FltPln error recovery.

v1.03 30-Jul-89

Database updated to FAA 27-Jul-89 revision cycle.
Fixed AutoA bug affecting "*fix A airport*" routings.
Fixed AutoA bug affecting "*fix A userdef*" routings.
Fixed bug in Search involving roundoff of distance.
Fixed bug in Search affecting battery longevity.
Enhanced Route→Revrs to reset fix-crossing times.

v1.02 19-Jul-89

Re-fixed bug in AutoRNAV affecting N–S courses.
Fixed trip log lat/lon display to show waypoint loc.
Enhanced Route→Load to reset fix times.
W&B setup, changed prompts from "Wt" to "Val".
Enhanced W&B to add CG display for Part 135 ops.
Backup to pak switches machine off to change paks.
Editing checklist rewinds saved position.

v1.01 07-Jul-89

Fixed bug in AutoRNAV affecting N–S courses.

v1.00 30-Jun-89

First commercial release.
Database based on FAA 01-Jun-89 revision cycle.

Have you updated your Flightmaster to version 2 software yet?

If you haven't, do it now!
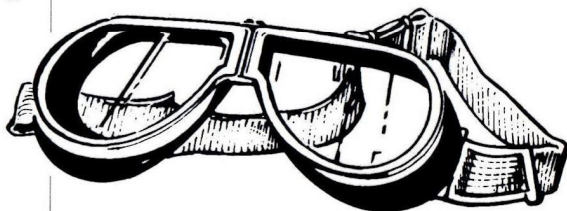
Ordering Information

Flightmaster

❏ Flightmaster $595
The complete handheld flight management system with battery, 75-page User's Guide, laminated quick-reference card, and a free subscription to the quarterly "Flying with Flightmaster" newsletter.

Flightmaster is sold with a rather extraordinary 90-DAY NO-RISK SATISFACTION GUARANTEE. Fly with Flightmaster. If you are not delighted with it, return it in original condition within 90 days for a full refund...no questions asked.

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 PCor 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 RAMPACK $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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