AVSIM Commercial Aircraft Package Review

PMDG 737: THE NEXT GENERATION
Boeing 737 -600/ -700/ -800/ -900
(Version 1.4 Update)

Rating Guide

Publisher: Precision Manuals Development Group

Description: Commercial Airliner simulation rich in panel realism and systems functionality
Here's PMDG's B737-900 in Continental Airlines livery — Click any image for full size view

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<td>and Maury Pratt, AVSIM</td>
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**Possible Commercial Rating Score:** 1 to 5 stars with 5 stars being exceptional. Please see details of our review rating policy [here](http://www.avsim.com/pages/0504/pmdg_737ng_review/pmdg_737_review.html).

**Test System**

P4 2.8 MHz with 512MB
WindowsXP
Ti4200-128 video card with 60.72 drivers

Introduction

The Boeing 737 is the short haul workhorse of the airline industry with over three thousand delivered over the last 35 years. And Boeing's "Next Generation" 737s are not only sleeker (the 177-189 passenger 737-900 is 138 ft. long), they feature state-of-the-art "glass cockpits" as contrasted with the older "steam gauge" appearance of earlier 737 models. In recognition of the short, stubby, earlier generation air transport jet's popularity, Microsoft included it in each Flight Simulator release since FS2000. Unfortunately, the Microsoft 737-400 is little more than a big Cessna with auto-throttle and bears little resemblance to the 737 that real airline pilots fly. Precision Manuals Development Group set about to change all that last year, with the release of their 737-600 and -700 NG aircraft.

Some may know PMDG from their 757 for Fly! which was a great add-on in its day, but limited to the loyal audience that stood by the Fly! simulator product throughout its many trials. This time, PMDG has released a Boeing airliner for MS Flight Simulator, bringing along their expertise in systems modeling that was one of the key attractions of the Fly! product line.

In this review we cover PMDG's newly released Ver 1.4 update, which not only adds the -800 and -900 variants to complete the Boeing 737 commercial transport family, but also 'retrofits' improvements in panel and systems functionality to the earlier -600 and -700 package, together with improvements in frame rate performance and welcome extensions to the documentation. Be advised that this update requires that the original PMDG 737NG base package (which required WindowsXP as well, but included both FS2002 and FS2004 versions) be installed on your system ($39.95 USD), and because certain refinements use features provided only in FS2004 this $27.95 add-on is available for FS2004 only.

PMDG offers liveries for most airlines flying specific 737NG variants—free for the downloading—so you can populate your simulation environment with as many types (version, engine and winglet options) as you like—and more are coming. There's also a free paint kit. Further choices are offered to customize panel arrangements, instrumentation features, and whether to load the virtual cockpit (VC)—with or without the "walk-around" cabin interior (which requires that the Active Camera add-on be installed)—to match your particular computer's power to simulation configuration.
workloads. We found frame rate performance, with our relatively high-performance computers (see the 'Test System' box), to be satisfactory with even the most complex capabilities loaded; this in itself is a tribute to the PMDG team's development skills and their concern for customer satisfaction.

PMDG's Boeing 737 family offers up a complete systems simulation of the real thing. Glass cockpit instrumentation, overhead panel, and Flight Management Computer (FMC)—it is all there and it works. A word of warning: if you are looking for a "one button start-up and go fly around" kind of aircraft, this is not the add-on for you... If, on the other hand, you enjoy reading Boeing Operations Manuals and wish you could afford the cost of a couple of hours of 737NG simulator time, this may very well be the best purchase you could make. The attention to detail and authenticity is awesome and the documentation makes for many hours of happy reading.

Those of you who are familiar with sophisticated 3rd-party airliner simulation add-ons such as Wilco's 767PIC or recent PSS offerings will feel right at home in PMDG's 737NG cockpit. Those who's air transport simulated flying is pretty much limited to the default 737 will probably feel somewhat bewildered at first. Nevertheless, it's not that hard to begin enjoying this product if you let the plane's flight automation features do much of the work initially—just load the plane with its engines running, enter a flight plan into the FMC and perform a few initialization steps, and then click on the flight director and the MCP's LNAV button (along with initial course, speed, heading, and altitude settings); arm the autothrottle, click the TO/GA button and take off, clicking the A/P and VNAV buttons after wheels-up. The FMC/autopilot system does the flying, even including an 'autoland'. It'll take a little effort to learn how to set up the FMC, but that's quite intuitive once you catch on to it. Even DPs (SIDs), airways, STARs and runway approach details can be entered into flight plans automatically, using current AIRAC and procedure data downloaded from the PMDG website.

Of course, you can fly 737s entirely without the FMC, using the MCP's autopilot functions at your discretion—but you should learn a little more about the difference between 'LVL CHG' and V/S mode climbs and descents and the like first. Then go on to learning the procedures to set up the plane's systems (electrical, hydraulic, pneumatic, fuel pumps, etc.) from a "cold and dark" cockpit, pushback (that's implemented too) and engine start. Sound like fun? It is! There's enormous satisfaction in learning what's actually going on "up front" in real world air transports.

PMDG released their original 737NG only weeks before Microsoft released FS2004, and there were some initial teething problems which were corrected in several Service Updates. As of January 2004, the -600/700 base product had stabilized with Service Release 3; since April's Release 4 users have reported a few bugs which are being corrected (and 'work-arounds' for those few who are affected are already available).
The 737-800/900 Upgrade

Since PMDG has chosen to package the 737-800/900 models as a separately orderable upgrade package and continues to offer the 737-600/700 as the base, let's answer the obvious question: "What do I get, other than two new models of the 737?" in two ways; first for the existing 737NG owner, and then for the new purchaser.

For the existing 737NG owner . . .

The model 800/900 upgrade makes a number of changes and enhancements to the panels, adds new levels of functionality to the modelled systems, and last but not least, adds two new, bigger models to the hangar. These changes also affect the existing 600 and 700 models, so you are getting the new cockpits appearing throughout.

Though we'll illustrate some of the changes via screenshots, in many cases the changes are quite subtle and buried inside the modelled systems.

Immediately noticeable is the replacement of the panel backgrounds by new photorealistic depictions. The overhead panel looks much more like the real thing now, but also the main panel has lost the sterile look and has more of a "lived in" look to it. Also note the upper edge of the windscreen becoming visible which adds to the "being there" feeling. The night lighting has also been changed, and we think for the better. The flood lit appearance has given way to a more subdued look and one that is more pleasing, especially if you are looking at it for long periods. Also, all knobs in the Virtual Cockpit are now clickable.

The new TCAS and other enhanced systems functions are described elsewhere in the review.

The documentation has also been updated to include the new model specifications and features, along with two new sections, Chapter 9 – Automatic Flight Management Systems, and Chapter 10 – Manual Flight Techniques.

For the existing 737NG owner, the upgrade is a welcome addition that continues the PMDG tradition of attention to detail and introduces new capabilities that are just waiting to be explored. The TCAS function all by itself adds a new dimension to the flying experience. In the real world, the pilots only get alerted to other traffic if the TCAS system detects a potential conflict, but fortunately the decision here was to depict other traffic in all (non-threatening, as well as conflicting) situations. If you use the 737NG a lot, you will want this upgrade!

For the new purchaser . . .

You have a choice. You can start with the 600/700 series which gives you a well rounded, mature package offering many hours of learning and enjoyment flying this state-of-the-art airliner, and you can upgrade later when funds permit. Alternately, if you just have to have the complete package, and money is not the issue, you can order both
at once and jump right into the full package. The choice is yours! (PMDG’s president Robert Randazzo says a -600/700 update is in the works so later you’ll have the option to upgrade that package without buying the -800/900 too.)

Installation and Documentation

This package can be ordered on the PMDG website as an e-commerce purchase. Shortly after ordering, you receive a personalized download link via e-mail. Hopefully, you have a good Internet connection, as the NG arrives as a 68 MB base product plus the 45.6 MB Ver 4 update zipped download. Inside each of the two zip files you’ll find a read-me file and an executable installer program. After verifying your FS2004 directory, all files, including Reference manuals and Navigation Database are installed on your computer. This worked without a hitch on both our systems.

If you would like to equip your aircraft with a favorite paint scheme, there is a good chance that you can find it in the PMDG downloads section under 737 Liveries (now more than a hundred type/airline files).

The documentation set is so extensive that we felt it deserves further discussion. Maury offers a suggested "strategy" to selecting which of the Aircraft Operating Manual's 10 chapters to read first to get a handle on this product more quickly — so click PMDG v1.4 Documentation for that (or continue reading here if you prefer).

We suggest also downloading Fred Clausen's introductory PMDG Flight Tutorial (pmdg_flight_tutorial_v2.zip, freeware) from the Avsim library, which provides a step-by-step introduction to the NG's systems that may be new to many aspiring "Captains." Lastly, as you gain more experience, you may wish to upgrade your skills via Timothy Metzinger's more comprehensive Advanced Operations Tutorial (737ngadvtutorialv2.zip, donationware), also in the Avsim library. Make sure you set some quality time aside for this training program; you are going to need it!

The External Model

As the attached pictures attest, the PMDG 737 looks great. The default package includes "factory" PMDG -600, -700, -800 and -900 models with a choice of conventional wings or the newer wings with winglets. The best is yet to come, however... A look at the downloads section at the PMDG website shows a long list of available liveries (from Aero Mexico 737-700 to WestJet model 700 with Winglet and Stairs) that can be downloaded at no additional charge. The liveries come professionally packaged with a preview picture, an installer, and a user rating which gives you some guidance in selecting only those liveries that you would like to have for your personal fleet. Since I live in Canada (near Toronto Buttonville CYKZ airport), I chose to equip the tested 737NG with the local Air Canada livery which has a realistic, slightly worn look to it, much like the real ones flying here. I also
These Overhead panel switches perform specific systems functions – plan to spend some time learning what they are!

This virtual cockpit is a joy to behold!

You can click any of the LCD CRTs for highly legible pop-ups while flying with either the 2d or VC cockpit modes.

Here's the upper EICAS display viewed by clicking on the 2d panel; if you right-click on the panel upper EICAS the lower EICAS pops up (showing either the rest of the engine readouts or downloaded the WestJet livery which looks like it came fresh from the factory. No matter which livery I tried, the 737NG is just wonderful to look at, the proportions are just right and the details are very well done. The wings and tail have the proper shiny aluminum leading edges and the landing lights look like the real thing, even when you zoom in for a closer look. You'll find yourself panning around the aircraft, simply admiring the looks of this plane. The animation sequences that lower the flaps, extend the slats, or lower the gear in flight are a work of art. For those who like eye candy, the icing on the cake is the very detailed sequence of the door opening and the stairs rolling out.

**The Interior — Panels & Cabin**

PMDG provides a choice of 2d and virtual cockpit (VC) panel configurations. I found myself often wandering over to visit the virtual cockpit which looks great, especially at night, but actually doing most of my flying in the 2d cockpit. As in all airliner cockpits, the challenge is to get as many instruments into view as possible without making them appear crowded or even worse, illegible. This is a challenge that the actual aircraft manufacturers face as well and most real cockpits have instruments surrounding the pilots in all directions: right, left, up, and down. The real breakthrough has been the move toward glass cockpits, and (by using software rather than hardware) to focus the displayed information on what is essential to the task at hand and using colours to highlight conditions that need attention.

Not everyone agrees on whether virtual cockpits are a good or a bad thing, so here you get a choice. Three versions of the aircraft interior are offered: 2d panel only, 2d and VC only, and 2d, VC with cabin views. Since this simulation uses up a lot of memory, it is wise to select the configuration based both on your preferences and the kind of system you are running on. Let me say right away, that I had good results with 512 MB of memory, but that was without running additional programs in the background.

**Panel features**

The change you'll most likely notice in the Update release is the panels' realistic appearance, and the virtual panel's clarity and improved lighting. Notice the difference between the base 737NG 2d and VC panels (left) and similar views from the Update product (right):
There's a new chronometer pop-up too.

The panel's night lighting is very pleasing ...

... As is the VC panel at night.

Take a seat in the first-class section (notice the galley details) ...

The main panel offered in the original 737-600/700 base product ("Z" view mode selected)

The main panel as it appears in the current -600/700/800/900 product

VC panel as offered in the original base product

VC panel as it appears now with 'dome' light illuminated

**The Main Instrument Panel:**

The first thing you notice in the main panel view, are the three big flat panel screens in front of you, the Primary Flight Display, Navigation Display, and Engines Display, respectively. Each of these can be clicked and enlarged if your eyesight requires it. I found them to be easily readable in their native views, but it is a nice feature, nevertheless. The second thing you'll notice is that the Mode Control Panel (the MCP is your interface to the autopilot controls) has grown in complexity. It has functions like VNAV, LNAV, and LVL CHG that clearly set it apart from the default Microsoft 737 autopilot and signal that you are now in the major leagues. The third thing is the cryptic letter combination MZALFOTRC off to the side. The letters are clickable and serve to open up a set of panel windows and views, including a captain's view, landing view, and zoomed in view. After a while it becomes second nature to click on these letters when required, and thankfully, once you've grasped the concept, it works consistently throughout all the windows. The -800/900 upgrade has added a separate clock panel to the cockpit in response to customer requests. This clock was already available in the captain's view, but this option allows the clock to be visible in the other views also.

Another new feature is the customization of the panel screens in
accordance with actual Airline configurations. From the PMDG / Styles menu, you can select your favorite airline and the panel is adjusted accordingly. Notice the depictions of analog instruments in picture of the Southwest Airlines configuration below. They selected this option to allow for easier cross training of pilots between the older and newer 737 models. As you can see: if it exists on the real 737NG, it finds its way into the PMDG product!

Now that's attention to detail!

In this airline-specific panel layout the earlier 737 instrument format has been carried over to the NG for commonality across Southwest Airlines' entire 737 fleet.

There's quite a lot of detail and superb functionality in this and the other panels mentioned below, but rather than paraphrase PMDG's Cockpit and Systems manual here <G> we felt it would be more helpful in this review to comment on only a few of these, and to mention a few additions made with this Update release. You'll find that discussion here.

The Overhead Panel:

The letter "O" stands for Overhead panel and here is where most of the pre-flight switching goes on to take the airplane from a cold, dark cockpit to a fully powered configuration, ready for take off. And for those who do not like flipping switches... yes, you can start the airplane by using the default Ctrl-E combination. For the /800 upgrade, the overhead has acquired a new sleek look and full clickability in the Virtual Cockpit (VC). It is conveniently accessed from the main panel views and offers a detailed, but yet readable layout. In the VC, the dome light is now also functional and provides for additional lighting if you find the default lighting too dark to locate your map, or cup of coffee.

The Radio Panel:

"R" stands for radios, and here is where you select your communication frequencies, navigational aids, and run the initial test of the TCAS system and subsequently select the TCAS modes for the flight. Just as a note: to activate the TCAS read-out, you also need to remember to activate it on the main (EFIS control) panel, by pushing the TFC button.

The Flight Management Computer:

The letter "F" brings up the Flight Management Computer (FMC). This is where you spend quality time for pre-flight route programming, as well as event based in-flight adjustments,
as ATC decides to vector you all over the place. Unlike earlier simulations of the 737 FMC that we have used, this one is fully integrated with the cockpit instrumentation. Just to add to the realism, you can actually have two FMCs active, just like in the real aircraft.

There are a number of things the FMC can do to automate many pre-flight and flying tasks. We've seen most of these features in other simulated transport aircraft, however PMDG has succeeded in combining an amazing number of functions into a single package. One you don't often see that PMDG has included here is the FMC's HOLD function. You can set up and execute holds while airborne (as you would in response to ATC instructions) with ease.

Another nicely-implemented feature is the "Plan" mode illustrated in the figure on the left below. The odd-appearing approach displayed on the ND illustrates how a flight path might appear in an area where geography requires staying clear of mountains or other obstacles—in this case entering the Los Angeles airspace from the Northwest by flying the SADDE SIX Approach. Notice that—if I were being instructed by a controller while flying online—I would probably be directed to fly East from SMO, then turn back to intercept the assigned runway localizer (KLAX's 25L in this instance) and fly the published approach to the West. I used the ND/FMC "Plan" facility to be satisfied that my flight path would be feasible.

You have a further sense of realism in that you can program speed and altitude restrictions into your flight plan. You can either enter that data based on an actual Departure Procedure (DP, also known as a 'SID') and Standard Arrival (STAR) chart (some of these data load automatically from the PMDG-supplied files)—others can be added in-flight based on unanticipated weather conditions and, of course, ATC instructions as you're vectored during your flight. As an example see the illustration on the right, where I augmented the RWY 25L approach previously loaded from the FMC's DEP/ARR facility.

With the ND mode selector set to 'Plan' I'm doing a visual check of my flight plan on the ND. Notice 'STEP' next to the 6R LSK, and that <CTR> is displayed next to RW25L in the flight plan.

Here's the FMC LEGS page showing page 3 (of 6) of our KSFO-KLAX flight plan. Notice that I've inserted a 170 kt speed and 8,000 ft altitude restriction in our selected approach to KLAX Rwy 25L.

Much more could be said here about PMDG's FMC implementation, but we'll conclude by listing a few features added in this Update release (you'll have to read the FMC Users Manual to make sense of these):

- AT OR ABOVE, AT OR BELOW altitude constraints supported
- COST INDEX implemented in PERF INIT page
- Route Offset capability

Numerous refinements were made in the Systems Update 1.3 release as well: SID, STAR,
and Approach transitions and missed approach procedures are supported. VNAV descent is more accurately planned based on predictive algorithms that include winds aloft. In flight under FMC control, your plane will decelerate before TOD if required. DES NOW / CRZ DES commands will level off at the highest altitude restriction, and so forth.

So, how well do the 737NG cockpit views work? One might think that glass cockpits would be much easier to render in Flight Simulator than conventional needles and dials, but neither the default Lear Jet nor the 777 glass cockpits look all that convincing to my eyes. Fortunately, PMDG used several approaches to make the cockpit readable and "believable," all of them well executed. First of all, there are several zoom levels for the main instruments: The basic panel view that includes the gear lever on the far right, a zoomed in view that enlarges the three panel displays, and a PIC view that only includes the two leftmost displays. This works well in practice and although each view is useful at different stages of the flight, the zoomed view is my favorite and the one I used the most when flying. Secondly, PMDG got the look right; the graphics are detailed and crisp enough that they still look great at higher magnification and, as mentioned above, you can also access the even bigger popped up instrument views, which I found handy when in the virtual cockpit.

Lastly, as of the -800/900 upgrade, the virtual cockpit is now fully functional, with the main panel, radios and overhead panel fully clickable (but not as yet for the -600/700 variants). With the many available view options, you can truly find your own personal comfort zone. To PMDG, a big "thank you" for listening to your customers and not settling for a one-size fits all implementation!

**TCAS / ACAS**

A really exciting new capability that was introduced with the /800 upgrade is a fully functional TCAS system. TCAS, or ACAS as it is known internationally, is an Airborne Collision Avoidance System. This is the first time that an aircraft in FS is not only capable of providing the situational awareness of TCAS detected traffic, but also able to provide manoeuvring advisories and visual guidance that correspond to the latest TCAS 7 standards.

According to Robert Randazzo, PMDG president: "The TCAS II Version 7.0 logic simulation was written by Lee Hetherington and is an accurate simulation of the logic as defined by document RTCA DO-185A, TCAS II Change 7 Minimum Operational Standards. The logic is capable of generating all types of resolution advisories (RAs), including visual vertical speed and pitch commands and aural alerts. It properly implements sense selection (go above/below intruder) and reversals, strength selection and changes, corrective vs. preventive RAs, and multi-aircraft RAs."

As Lee chronicles on the PMDG support site: "It is fun to chase down AI aircraft and see what kinds of Resolution Advisories the logic generates. It basically plays a lot of 'what ifs' and figures out the optimal vertical speed resolution given the encounter geometry. Hopefully others will have fun with it too and learn a bit about how real TCAS II v7 works. I think a lot of folks will be chasing traffic when this is released. Just don't do it on VATSIM in sight of ATC!"

I can testify to the whole new sense of being surrounded by real aircraft when flying with the TCAS functionality enabled. As in the real aircraft, you have a choice of seeing TCAS2 at its most realistic (surrounding aircraft are not displayed unless they trigger an advisory or resolution advisory) and also options to have the "situational awareness" of seeing all surrounding traffic regardless of conflict potential. Additionally, you can select an expanded range above the aircraft (when climbing) or below the aircraft (when descending). It does not get more realistic than this!

As an illustration, here are a few screenshots of overtaking an AI Boeing 737, while ignoring the increasingly urgent callouts to climb in order to avoid a mid air collision. The TCAS logic assumes a flight crew response within 5 seconds after RA, and it is not hard to imagine the sense of urgency that would ensue when the alarms go off while cruising at altitude or while descending through the clouds!

Flying the 737NG

The biggest surprise to me was how well behaved this aircraft is, when flown by hand. It is a pleasure to set the flaps to 10, rev up the engines, and accelerate down the runway. Rotate at around 135 kts with a heavy fuel load, pull up the gear, and you are climbing away. Likewise, when you are coming in for a landing, it is easy to take over from the autopilot when stabilized on the approach and touch down "on the numbers." Most of the flying, however, is done using both autopilot and autothrottle, and you quickly begin to appreciate how much work this takes off your hands as you are adjusting the FMC in real time in consultation with charts on your lap. The FMC really deserves a review all by itself! It comes with a 50 page reference manual in pdf format, but is more easily approached by going through the tutorials. Now, you begin to understand what it takes a real life ATP to get a type rating on an aircraft like this!

If you really want to get into the guts of flying this aircraft, I can think of no better way than downloading Timothy Metzinger's 737NG Tutorial, printing it out, and working it through from cover to cover. Avsim's Managing Editor Aidan Williams (who admittedly is a GA enthusiast) did—he remarks, "I have gone from knowing absolutely nothing about heavy flying and FMCs, to being able to start from a cold cockpit, program the FMC, fly it and do a Cat 3 autoland, all by following Tim's tutorial." Aidan shares that experience in this 'sidebar' to our review "Lightweight to Heavyweight".

It is significant that most of the PMDG team as well as Tim himself are qualified pilots. If you are still undecided as to whether this aircraft add-on is for you, I'd suggest you download this tutorial from the Avsim library and thumb through it. The decision after that is simply whether you have the personal time available to fully enjoy this aircraft. Which might go something like this:

Just like in the real world, the piloting tasks begin about 30 minutes before takeoff, by loading up the airplane with passengers and cargo, using the supplied PMDG load manager program. As this is going on, you get electrical power established in the cockpit and wake up the Flight Management Computer. After consulting the paperwork that the airline provides for your route, including planned passenger, freight, and fuel loads, you enter the flight plan into the FMC and then review the resulting track on the Navigation Display in plan mode. To assist you in this task, the navigation database includes not only Nav Aids and Waypoints, but also Jetways, published departures, arrivals, and instrument approaches (SIDs, STARs, and IAPs) which can be loaded and executed via the Flight Management Computer as part of a flight plan. If the particular procedure is not in the database, you can even write and add
your own—a tutorial for this can be downloaded from the PMDG website. Once you have the flight plan entered and checked, you enter fuel load and takeoff flaps settings and get the FMC to calculate and load the takeoff reference speeds, after which you get a chance to relax as you wait for the last bags to be loaded on board.

You are going to need this rest, for unlike the real aircraft, you are captain and first officer all rolled into one, so there is plenty to do to keep you busy.

After starting the engines, getting taxi clearance, and finding your way to the active runway, you review the takeoff checklist and decide if you want to fly by hand or let the autopilot guide you through the actual takeoff. If you choose the latter, you initiate the takeoff by pressing the simulated TO/GA (Take off / Go-around) button. You'll feel the autothrottle spool up the engines, hear the speed read-outs as the airplane accelerates, as you concentrate on following the flight director bars and retracting the gear and flaps at the right moments. This quickly gets you to a few thousand feet altitude and you can start to think about pushing the LVL CHG, LNAV and VNAV buttons which allow you to take the hands off the yoke and admire the scenery below. Now, you can have a cup of coffee and consult your charts.

At any time, the LEGS button on the FMC gives you a preview of the upcoming waypoints as well as allowing you to make mid-flight adjustments when circumstances force you to make changes to your original flight plan. Just to give you a recent real-world example, as my wife and I were flying from Charlotte NC to San Juan PR, the captain came on to tell us that the flight would be longer than usual because he had to route around the active missile testing range at Cape Canaveral... Only five minutes later, he came back on and announced that we would be changing course to a direct route, because bad weather had led to the missile test being postponed. I'm sure he had these routes pre-programmed in the FMC and only a few button presses later, the airplane had its updated instructions.

Back to your pilot duties... About 30 minutes before the end of the flight, the FMC gives you all required information about when to start the descent and will fly the selected approach into the airport, all the way onto the runway, if you let it, or you can switch the autopilot off and land by hand. The auto brakes deploy upon touch down and, if you really greased it, you can of course use the Replay feature to watch the outside view as the wheels give off smoke as they touch the ground and the spoilers go up to kill the remaining lift and prevent you from getting airborne again.

I hope that we have given you at least a feel for how real this simulation can be once you get to know the systems. There is much to explore here, and a three page review only begins to scratch the surface. So, load up your printer with paper, print out some of the excellent material, and set aside time to get familiar with this awesome airplane.

**System Performance**

I do not have access to a variety of PCs to test on, but I can certainly attest that this aircraft flies flawlessly on my P4-2.8. If you are concerned about using the 737NG on the system you have at home, have a look at the PMDG forum at Avsim. There are several discussions about systems requirements, with most users with 2 GHz processors and above reporting good results.

Avsim's Managing Editor Aidan Williams provides these additional screenshots:
Summary

The best way we can think of describing the PMDG 737NG is to say that it is "a simulator within a simulator." It sets new standards in almost every aspect of FS aircraft implementation. If you want to get a feel for what your almost $68 USD will buy you (or about $28 if you already have the base 737NG), download and peruse Timothy Metzinger's wonderful tutorial. It introduces you to all aspects of operating the aircraft in an entertaining, simulated ATP training program sort of way. If after reading a couple of chapters in the tutorial, you are eager to try it out, it is safe to say that this is the one add on you should buy for FS2004. Another source of information is the lively PMDG forum on Avsim. The PMDG team is fully engaged in the discussion and have earned the respect of their customer base by their professional approach and their passionate attention to detail. It probably does not hurt that Robert Randazzo, the president of PMDG is an active Airline Transport Pilot. So, do we like this package? You bet! It significantly expands the Flight Simulator experience and makes the dream of flying a state-of-the-art airliner accessible to many new "Captains."

What We Like About the PMDG 737NG
- Amazingly complete systems simulation
- Very crisp and readable cockpits
- Beautifully modelled exterior
- Well behaved and easy to fly by hand
- As challenging as you want it to be when using the FMC
- Great customer support by the PMDG team

### What We Don't Like About the PMDG 737NG

- It's hard to find anything to dislike other than the amount of time it takes away from pursuing our other interests

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