FreyFlight

VOLUME 1

UNDERSTANDING THE BOEING 737

SYSTEMS, DISPLAYS AND FLIGHT LOGIC

THE COMPREHENSIVE PRACTICAL HANDBOOK
FOR VIRTUAL 737 PILOTS

understand the systems

understand the interrelationships

fly safely & realistically in the simulator

THE GUIDE AND REFERENCE BOOK FOR AMBITIOUS 737 PILOTS IN MICROSOFT FLIGHT SIMULATOR

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Understanding the Boeing 737
FreyFlight – Practical Knowledge for Virtual Pilots, Volume 1

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All cockpit images and screenshots were created by the author using legally acquired simulation software. The explanatory annotations, tables, and checklists were created specifically for this book.

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Note on the Illustrations
The cockpit illustrations and screenshots used in this book were created by the author using the iFly 737 MAX for Microsoft Flight Simulator. They are intended solely to illustrate the basic systems, displays, and interrelationships of the Boeing 737.

The iFly 737 MAX is the simulation model used in this book. However, this book is not an official manual for the iFly 737 MAX. The basic system principles described are intended to apply across different simulation products. Depending on the Boeing 737 variant and the simulation software used, displays, controls, functions, and system representations may differ in detail.

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iFly 737 MAX8 for Microsoft Flight Simulator
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This practical manual is intended exclusively for use in a flight simulator. It is not a substitute for real-world flight training, approved aircraft documentation, or official operating or safety manuals.

Welcome to FreyFlight.

Foreword

The Boeing 737 is one of the best-known and most successful commercial aircraft in the world. At the same time, it is a technically sophisticated aircraft whose operation goes far beyond simply flipping individual switches. Anyone who wants to fly the 737 safely and competently in a flight simulator should therefore not only know what to do, but also understand why it is done.

This is exactly where this book comes in.

“Understanding the Boeing 737” covers the most important fundamentals and interrelationships of the Boeing 737. The focus is on the aircraft’s systems, their functions, and how they interact. You’ll learn how the electrical power supply, the hydraulics, the pneumatic system, the fuel supply, the flight controls, and the navigation and autopilot systems work, among other things.

The goal here is not to memorize every technical detail. It is far more important to develop a fundamental understanding of what happens inside the aircraft. The aim is not merely to read gauges and messages, but to be able to interpret them correctly. This makes switch positions and procedures easier to understand and allows for better judgment even in unfamiliar situations.

This book is designed to be independent of any particular simulation add-on manufacturer. It is intended for users of modern Boeing 737 simulators—particularly the 737 NG and 737 MAX. Depending on the simulator and aircraft model used, displays, functions, and operating procedures may differ in detail. However, the fundamental technical principles remain largely comparable.

The individual chapters guide you step by step through the key areas of the aircraft. Tables, key points, and practical examples help make even complex topics easy to understand. You can work through the entire book or use individual chapters later as a reference guide.

This volume also serves as the foundation for the other FreyFlight books. While those books cover the specific procedures for certain aircraft models—from a Cold & Dark cockpit to shutdown—this volume provides the necessary background knowledge. The goal is to turn the mere execution of a checklist into a deliberate and comprehensible process.

My goal is achieved when, after reading this, you not only know which switch to press, but also understand what that switch does and how the systems involved work together.

I hope you enjoy reading this, gain many new insights, and, above all, have successful flights with the Boeing 737 in the simulator.

Friedbert “Bert” Frey
FreyFlight

The FreyFlight Book Series

Volume	Title	Focus
Volume 1	Understanding the Boeing 737	System logic, displays, autoflight, navigation and flight phases - applicable across modern 737 simulations.
Volume 2	Mastering the iFly 737 MAX	A complete practical workflow in MSFS - from Cold & Dark through shutdown.
Volume 3	Mastering the PMDG 737	A future companion volume covering PMDG-specific operation and features.

Three volumes - one goal: understand the Boeing 737 and apply that knowledge in the simulator.

Table of Contents

Understanding the 737 as a System

From Individual Switches to the Big Picture

The 737 has been continuously refined over decades. Despite modern displays and new engines, the fundamental operating philosophy has remained remarkably consistent: systems are clearly grouped, key functions have built-in redundancy, and the aircraft's status is indicated by switch positions, displays, and warning lights.

1.1 Variants and Common Core

Family	Typical Variants	Characteristics in the Simulator
Original	737-100 / -200	Early instrumentation and older engine generation; significantly different cockpit layout.
Classic	737-300 / -400 / -500	Transition to more modern systems and CFM56 engines.
Next Generation	737-600 / -700 / -800 / -900	Glass cockpit, modern FMC and AFDS logic; the basis for many add-ons.
MAX	737 MAX 7 / 8 / 9 / 10	Advanced displays and LEAP-1B engines; many operating principles remain typical of the 737.

Important: In this book, "general 737" does not mean that every switch position is identical across every model series. Rather, it refers to the common conceptual and operating principles of modern NG and MAX cockpits.

1.2 Three Questions Before Every Operation

1. What energy source or medium does the system require—electricity, hydraulics, compressed air, or fuel?
2. What source is currently supplying it—ground power, APU, engine, or a backup system?
3. How can I tell if the operation was successful or if there was an error—by the switch position, the FMA, a display, a warning light, or a measured value?

1.3 The Dark Cockpit Philosophy

In its normal, fully configured state, as few warning and indicator lights as possible are visible. However, a dark warning light does not automatically mean that the system is functioning correctly. Only the combination of the expected switch position, a plausible display, and the absence of a warning provides a reliable picture.

Color	Typical Meaning	Reaction in the Simulator
Red	Immediate warning or dangerous condition	Maintain control of the flight path, identify the cause, and apply the appropriate procedure.

1.4 Flow, Verification, and Checklist

A flow is a spatially organized sequence of steps through the cockpit. It brings the aircraft into the desired state. The checklist then verifies only the safety-critical items. Those who misunderstand a checklist as a complete operating manual often overlook the system logic between the individual checklist items.

Key point: Flow executes—checklist confirms—indicators prove success.

Cockpit Architecture and Scanning

Where information is generated and decisions are made

The cockpit areas are not arranged randomly. The overhead panel primarily houses aircraft systems; the main instrument panel displays the flight path and engine indications; the MCP controls the autoflight system; and the center pedestal contains navigation, communication, thrust, and configuration controls.

Figure 2.1: Main Instrument Panel, EFIS, and MCP

2.1 The Four Work Areas

Area	Main Function	Typical Questions
Overhead Panel	Supply and Aircraft Systems	Are power, bleed air, hydraulics, fuel, anti-ice, and lights functioning correctly?
Main Instrument Panel	Flight Path, Engines, and Warnings	What is the aircraft doing right now, and are the indications plausible?
MCP / EFIS	Autopilot and display selection	Which targets are preselected, and which modes should be active?
Center Pedestal	Thrust, Configuration, FMC, and Radio	What route, thrust setting, flap position, and brake setting are selected?

Figure 2.2: System controls on the overhead panel

2.2 The Normal Scan

A good scan moves regularly between flight path, autopilot, navigation, and systems. It does not linger on a single display. After every change—such as a new altitude—a brief chain of evidence follows: input on the MCP, expected FMA change, corresponding aircraft movement, and a plausible trend on the displays.

- PFD: flight attitude, airspeed, altitude, vertical trend, and FMA.
- ND: route, active waypoint, track, weather, and traffic.
- Engine Display: thrust, temperatures, pressures, and fuel.
- MCP: preselected targets and illuminated mode buttons.
- Overhead: only the systems relevant to the current phase of flight.

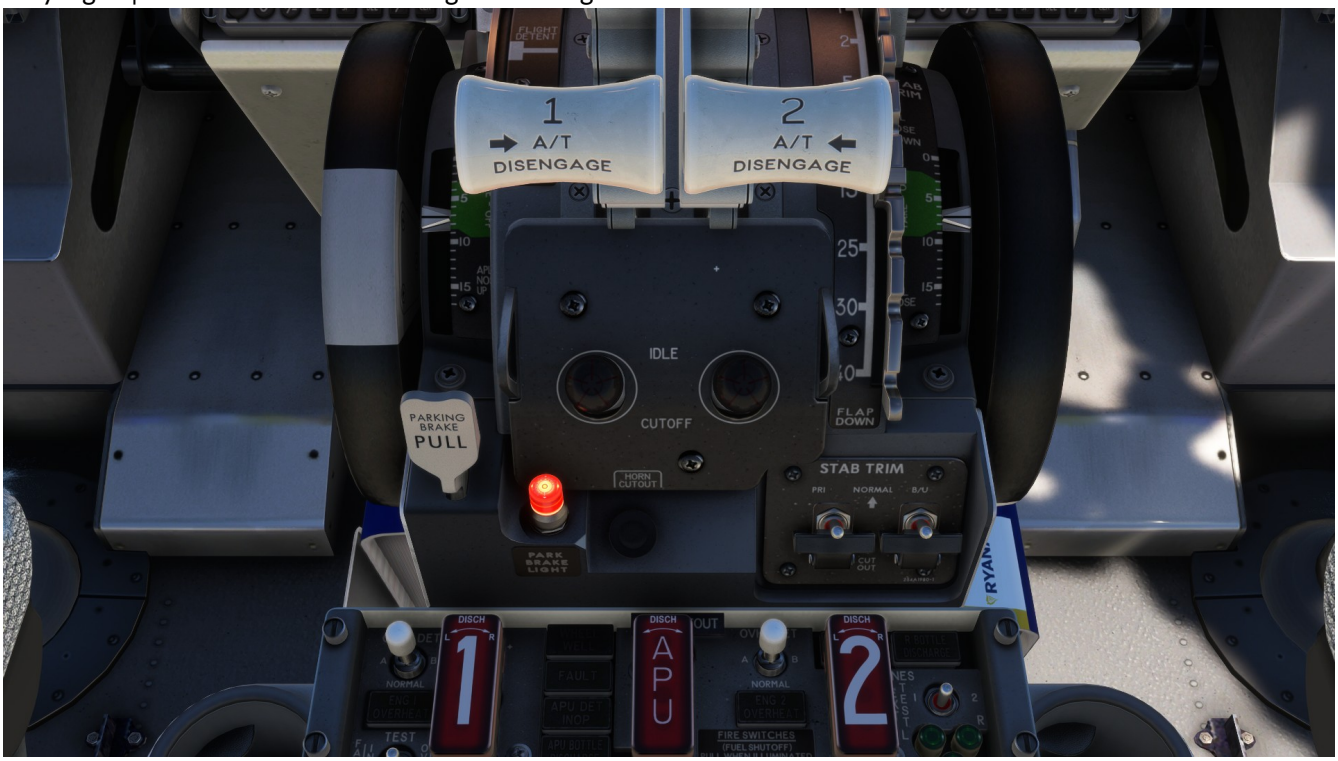

Figure 2.3: Thrust levers, engine start levers, speedbrake, and flaps

> **Rule of thumb:** Never operate multiple interdependent functions without verifying the response to the first change.

End of Book Preview

Understanding the Boeing 737

The complete edition covers the central systems, displays, navigation and autoflight functions, as well as the most important flight phases of the Boeing 737.

Understand what happens in the cockpit - and why.

More information about the FreyFlight book series:

www.freyflight.com