



TEACHING CONFIDENCE IN THE CLOUDS

AN INSTRUCTOR'S GUIDE
TO USING DESKTOP
FLIGHT SIMULATORS



**TOM
GILMORE**



Teaching Confidence in the Clouds:
An instructor's guide to using desktop flight simulators
by Tom Gilmore

Published by
Aviation Supplies & Academics, Inc.
7005 132nd Place SE • Newcastle, WA 98059
(425) 235-1500 • email asas@asa2fly.com
Internet: www.asa2fly.com

© 2007 Thomas N. Gilmore

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopy, recording or otherwise, without the prior written permission of the copyright holder. None of the material in this manual supersedes any operational documents or procedures issued by the Federal Aviation Administration, aircraft and avionics manufacturers, flight schools, or the operators of aircraft.

Photo/illustration credits and acknowledgements. Page xii, photo courtesy SDASM (San Diego Aerospace Museum) Library and Archives; Page xiii, "Blue Box" photo © L-3 Link Simulation and Training, used by permission; Page 3, 11, courtesy www.brooks.af.mil (website of Air Force Links Photos at Brooks City-Base); Page 4 (left), courtesy Air Force Links Photos; Page 4 (right), courtesy SDASM; Page 5, courtesy Link-Roberson Collection, Special Collections at Binghamton University Libraries; Page 16, courtesy Mark Anders, Lexington, KY; Page 17, courtesy ELITE; Page 18, 20, 24, 26, ©ASA, Inc.; Page 67, from FAA Technical Report (DOT/FAA/AM-02/19, Oct.2002); Page 68 and 69, courtesy Garmin. Photos used by permission—the author and publisher wish to thank the contributors for use of photography. All other photographs are by the author, all illustrations by the author (© Thomas Gilmore).

Printed in the United States of America
10 09 08 07 9 8 7 6 5 4 3 2 1

ASA-PC-SIMS

ISBN 1-56027-681-9
978-1-56027-681-4

Library of Congress Cataloging-in-Publication Data:

Gilmore, Tom

Teaching confidence in the clouds : an instructor's guide to using desktop flight
simulators / Tom Gilmore.

p. cm.

Includes bibliographical references and index.

ISBN-13: 978-1-56027-681-4 (pbk.)

ISBN-10: 1-56027-681-9 (pbk.)

1. Flight training--Data processing. 2. Flight simulators. 3. Computer flight games. I. Title.

TL712.8.G55 2007

629.132'52078--dc22

2007010285

CONTENTS

Preface	ix
Introduction	xi
1 The History of Instrument Flight	1
2 The History of Desktop Flight Simulators	13
3 Desktop Simulator Setup	23
4 Training Methods	31
5 Getting Started	43
6 Flight Visualization	55
7 Transitioning to Instruments	63
8 Incorporating the Desktop Simulator Into Flight Training Curriculums	75
9 Simulating Weather	85
10 Implementing Your Own Plan of Action	95
Appendix A—Private Pilot Basic ATD Syllabus	105
Appendix B—Instrument Rating PCATD Syllabus	115
Glossary	129
Index	135
About the Author	139



1

THE HISTORY OF INSTRUMENT FLIGHT

*...Without their joint efforts,
instrument flight and the practical use
of aircraft for transportation might
not have been possible.*

THE EARLY PIONEERS

Let's step back about 80 years and look at the progress that's been made in instrument flight. History tells us many interesting stories about the people who led the charge toward learning to fly on the gauges. These stories are the springboard for all the expertise leading up to our current glass cockpit technology.

The early pilots realized the aeroplane was a great traveling machine, but it lacked the equipment that could take it to a practical level. The Wright Brothers had set the stage with their first recorded powered flight in 1903. Aircraft design, along with brave pilots making trial and error flights, was moving the field of aviation toward a new frontier, marked by what seemed like an impossible feat: true instrument flight.

Pilots and aircraft manufacturers were already pushing the limits of flying cross-country in good weather. It was when they lost sight of the ground that their feelings of safety began to fade. It must have been an exciting time in aviation as the mysteries of instrument flying were unraveled. The first fledgling pilots who tried trusting their inner senses would have met with horror as they spiraled out of the overcast skies. Most did not survive.

Four pioneers rose to the challenge of solving the complex environment associated with instrument flight and combined their talents during the late 1920s. They were William Charles Ocker, Jimmy Doolittle, Lawrence Sperry and Edwin Link. Without their joint efforts, instrument flight and the practical use of aircraft for transportation might not have been possible.

Back then, instrument flying was a mystery. Spatial disorientation (SD) as we know it today was not a known human frailty. The first discovery of spatial disorientation was made when a heavier-than-air aircraft entered a cloud. A young Dutch pilot at RNAF Soesterberg noticed the earth's horizon was tilted upon exiting a cloud formation in his vintage WWI aircraft, although he had the perception of flying straight and level inside the clouds.

William Charles Ocker

William Ocker held the rank of Corporal when he proposed the theory that pilots shared a weakness in not knowing which end was up without external references. He was a Colonel by the time he completed his research. Most of his contribution to instrument flight came prior to the invention of the artificial horizon and directional gyro. When Ocker discovered and experimented with SD, the

turn and bank indicator was the only gyro instrument that could be counted on for maintaining level flight in the clouds. Because of this, Ocker was the first person to dispel the idea that a pilot could keep an aircraft in controlled flight in the clouds simply by feel. This “seat of the pants” method of instrument flying managed to kill a lot of pilots, especially airmail pilots. Before long, these accidents got the government’s attention, which led to an all out effort to solve the problem. Eventually, pilots understood that the ear’s vestibular system could not keep a pilot in control when flying without the natural horizon.

Ocker and his assistant, Carl J. Crane, experimented with an early training simulator, and Ocker wrote the world’s first manual for instrument flight, *Blind Flight in Theory and Practice* (1932). Orville Wright once called Ocker a great “missionary” for instrument flying and credited him with having the most influence on the study of instrument flight training.



William Ocker

Ocker and Crane performed some unpredictable experiments, such as dumping blindfolded pigeons from aloft. After spiraling around and flying upside-down, the pigeons just spread their wings and floated safely to earth. The two investigators were thus convinced of ways to overcome spatial disorientation without reference to outside cues. We, of course, know that what gave the blindfolded pigeons a safe descent to earth is not what pilots use to confidently fly on instruments.

Colonel Ocker’s solution was to configure the turn and bank indicator, the airspeed indicator and the compass. These primary instruments helped the pilot determine his correct orientation regardless of outside conditions. Colonel Ocker, along with Lieutenant Crane, began to train Brooks’ air base cadets in the use of instrument flying techniques. To demonstrate the effectiveness of instrument flying, Colonel Ocker flew 900 miles, solely by instrument reference, from Brooks Field to Scott Field in 1930. Shortly after, the military began experimenting with his innovative system and by the outset of World War II, instrument flying was a solid element of aircraft design and pilot training.

Prior to the invention of the gyro horizon, when the turn and bank indicator was the only gyro instrument available, flight instructors

TEACHING CONFIDENCE IN THE CLOUDS

Instrument flying is truly an art. This book describes how to develop this skill with special tips from a highly experienced instrument flight instructor.

AN INSTRUCTOR'S GUIDE
TO USING DESKTOP
FLIGHT SIMULATORS

by TOM GILMORE

In this new and challenging era of glass cockpit general aviation aircraft, innovative aircraft design and recent advances in avionics technology have forced pilots to totally change how they use and pilot their aircraft. Students are becoming more technically savvy, and with time/money always at a minimum, there is a demand for highly skilled flight instructors who know the best teaching methods for flying IFR or in IMC.

Teaching Confidence in the Clouds offers real-life application of computer desktop flight simulators and flight training devices as they relate to current methods of instrument training. Since they were first adopted in 1997, FAA-approved desktop flight simulators have been an effective means to train students. The scenario-based training concepts and FITS principles contained in this book will be a valuable resource for both the flight instructor and the pilot who wants to train for the coveted instrument rating.

"Now—at last!—[PCATD] teaching techniques are addressed in a clear and organized fashion... Tom Gilmore has created a tool which thousands will call on time and again."

—Rusty Sachs, NAFI Executive Director



Tom Gilmore is a full-time flight instructor and owner/operator of Gilmore Aviation Services (www.gilmoreaviation.com). He teaches advanced flight training with his own specially developed syllabus. He is an Orlando FFAST team member, active in the Wings program and a Master CFI and Gold Seal Flight Instructor. His experience has been in teaching people to fly for over 37 years.



Aviation Supplies & Academics, Inc.
7005 132nd Place SE
Newcastle, WA 98059
www.asa2fly.com • 1-800-ASA-2-FLY



PNR ASA-PC-SIMS

ISBN 978-1-56027-681-4



9 781560 276814



5 1995