# Analysing ANS Performance with R

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# Preface

## About this book

This book documents a journey into using open source software for the operational performance analysis of Air Transportation and Air Navigation Services. The concepts presented in this book are informed by the experience of a series of international benchmarking projects. Discussions in - **and lessons learnt from** - these projects revolved around similar themes. This book would have not been possible without the discussions and generous time of all participants in these projects.

The book is written to help researchers, ANS performance analysts, and interested parties in establishing reproducible performance reports in accordance with the international conventions put together by the benchmarking community in response to the Key Performance Indicators proposed by ICAO in the on-going refinement of the Global Air Navigation Plan.

## Structure of the book

This book is organised in several parts.

- **Part I** provides an introduction to Air Transportation and Air Navigation and sets the scene of our study area of interest.
- **Part II** gives a *getting-up-and-started* crash-course with the R/RStudio Ecosystem. This book cannot distill the many useful introductory books on R, RStudio, various packages, and concepts. However, the information should be enough to replicate the examples and get the interested researcher/practitioner up and running!
- **Part III** introduces the set of operational performance indicators and associated ansperf functions.
- **Part IV** demonstrates use case analyses

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to be developed
```

# 1  Introduction

This will be the introduction of ANS Performance with R.

# 2 2nd Chapter

Here comes a new chapter.

# 3 Next Chapter

cool text and more fun.

just to make sure it works a 2nd time.

this is now rendering from terminal

# 4 Using R

This section provides a short introduction to R. The R-ecosystem provides a rich environment for data analytics. This section offers a crash-course like walk over some basics and the use of the {tidyverse} packages. The goal is provide "enough R" for a newcomer to follow the code and understand to call the provided functions or adapt the analysis template to own needs/interests.

## 4.1 R-Ecosystem

## 4.2 Install R

- install R from CRAN
- install RStudio - now called Posit
- install Quarto
- recommendation - set-up a github account for archiving

## 4.3 Navigate RStudio

- editor, console, top right, and bottom right

## 4.4 R as a calculator

- basic operation
- some useful baseR functions, getting help
- data types: vectors, data.frames (now tibbles), and lists - mention other, but do not elaborate
- data.frame/tibble operations, [row, column], [ and [[, $

## 4.5 Tidyverse Data Crunching

- dplyr

## 4.6 Plotting with {ggplot2}

- grammar of graphics
- skeleton plot
- barcharts
- scatterplot and timelines
- moving from static to interactive (plotly) or animated

## 4.7 tbd

## 4.8 Summary

This section aimed to provide a basic understanding of the R-ecosystem for the analysis of operational performance. By no means this section can cover all packages in detail. The interested reader is encouraged to continue to learn, study, and further explore the ecosystem. There is a wealth of youtube or written tutorials. Enjoy.

# References