



ECA
European Cockpit Association

TCAS operational aspects a pilot's point of view

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TCAS – some basics

- Threshold for TAs: 20 – 48 seconds
altitude threshold 850 to 1.200ft.
- Threshold for RAs: 15 – 35 seconds
altitude threshold 600 to 800ft (preventive)
300 to 700ft for corrective RAs.
- range threshold 0.2 to 1.1NM for RAs

TCAS – manoeuvre, how to fly

- vertical manoeuvre be initiated within
 - 5 seconds (initial RA)
 - 2,5 seconds (modification of initial RA)
- strength of vertical manoeuvre
 - ≈ 0,25g for initial and weakening RAs
 - ≈ 0,33g for subsequent RAs
- vertical speeds from 1.500 to 2.500 ft/min

TCAS – training requirements

ICAO PANS-OPS

Attachment A, Part III, Chapter 3, Section 3

- 5.4 Pilots should fly all scenarios once every four years.
- 5.5 Pilots should complete all scenarios once every two years if CBT is used.

→ Sufficient training???

→ Targets of training correct?

TCAS – training requirements

ICAO PANS-ATM 3.2.c(6)

“limit the alterations of the flight path to the minimum extent necessary to comply with the RAs;”

Something from a manufacturer's AFM:

“climb, climb” – climb at rate shown on the green arc of the IVSI/PFD

TCAS – training requirements

Present ACAS-displays look like a “fly to” (green arc) indication!

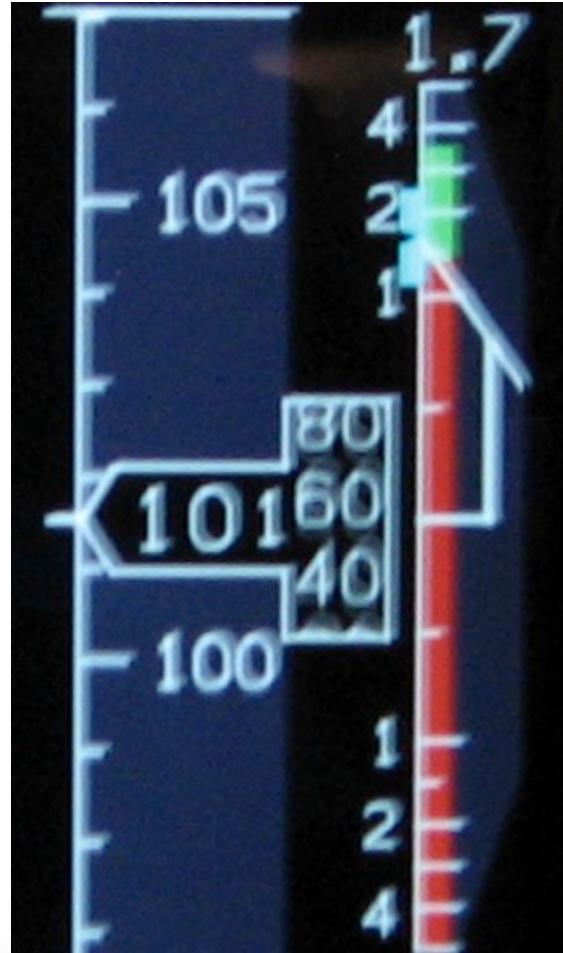
According to ICAO PANS-ATM it is a „fly away from“ (red arc) indication as alterations need to be limited to the MINIMUM EXTENT NECESSARY to comply with ACAS RAs.

TCAS – display options

How is this displayed?



TCAS – display options



Typical up-to-date TCAS-indication on IVSI.

Climb-RA:

- red tape up to 1.500 ft/min
- green tape from 1.500 – 3.500 ft/min

Precise fly-to indication?

TCAS – display options



TCAS operational aspects, a pilot's point of view

Typical indication onboard
a Boeing 737-800NG.

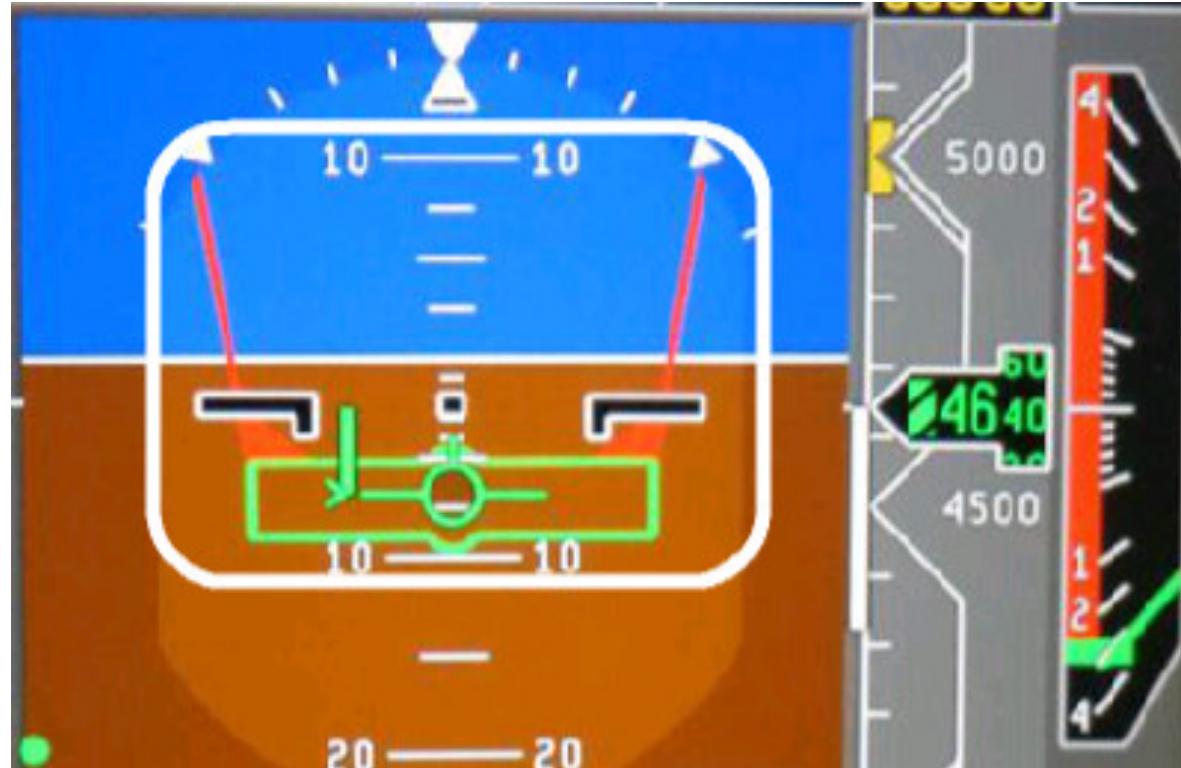
ACAS-advisory is shown
as area where the pitch of
the aircraft
SHALL NOT BE!



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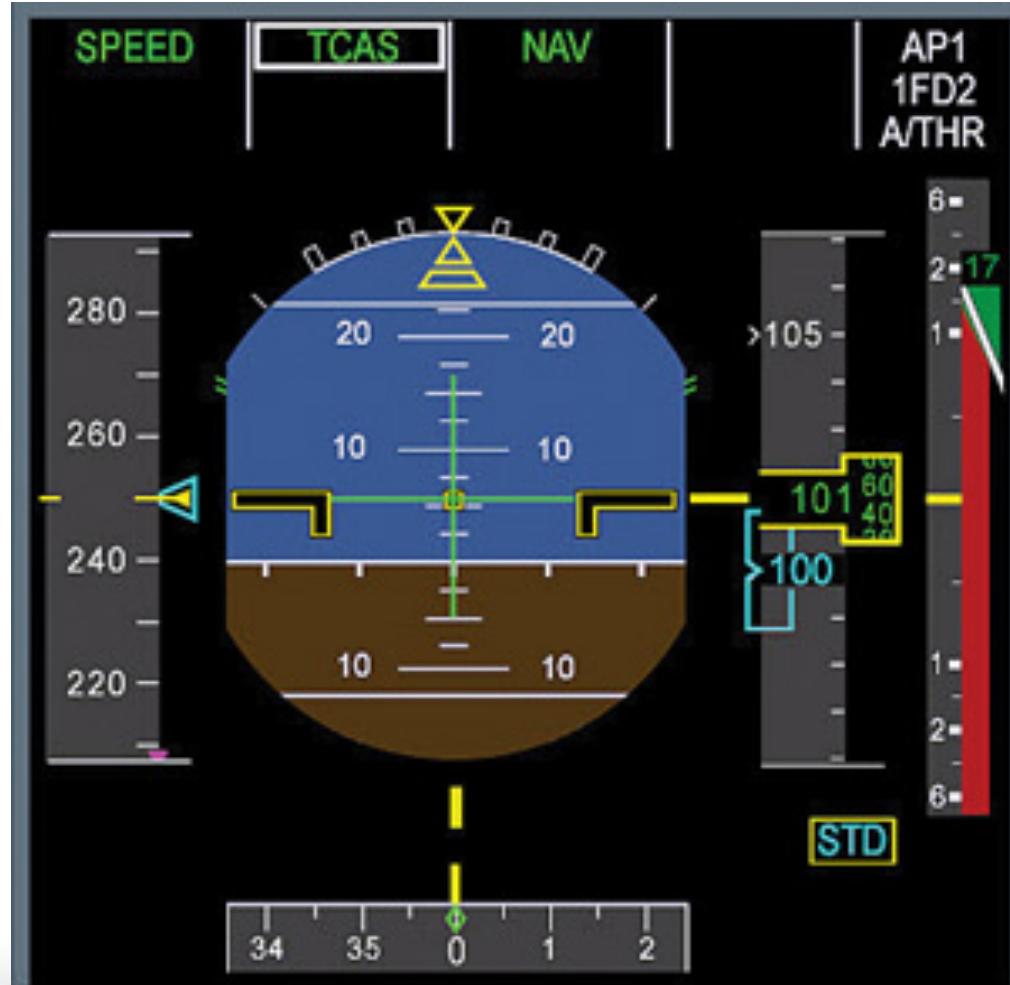
TCAS – display options



ACAS-display
onboard of an
Embraer 190.

Green fly-to
zone for the
flight path vector.

TCAS – display options



Display on a A380 equipped with A/P flight director TCAS-mode.

Precise “fly-to” command on ADI.

TCAS operational aspects, a pilot's point of view



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TCAS – way forward ...

- ACAS need to feature a precise “fly-to” indication to assist pilots
- automation may be an option!
- use of autopilot shall not be forbidden by SOPs

- training of pilots need to be more realistic
- more training (every year at least!)
- precise compliance needs to be emphasized

TCAS – time to discuss

**Thank you for
your attention!**

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