Collision avoidance on the UKCS
(TCAS II Trial)
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Oil & Gas UK
the voice of the offshore industry


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Traffic Collision Avoidance System II

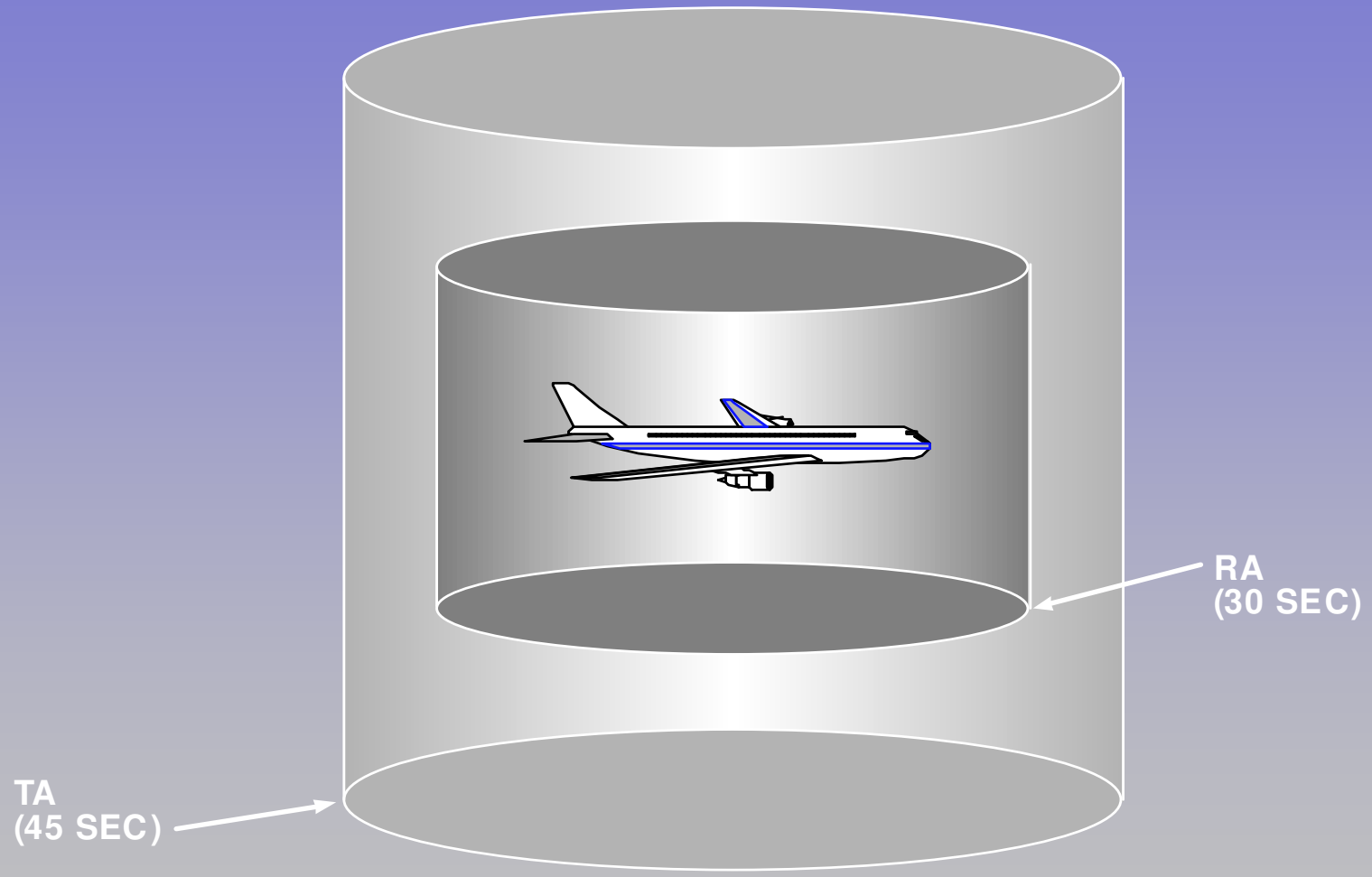
Safety Systems

- Type 1
  - Rebreathers
  - EXIS lights
  - External liferafts
  - Crashworthy seats
  - Automatic Float Deployment Systems
- Type 2
  - HUMS
  - HOMP
  - TCAS II

Background - What is TCAS?

- **TCAS: Traffic Collision Avoidance System**
- TCAS development is an American initiative, preliminary studies in 1955
- **TCAS II version 7** is the only equipment complying with the ICAO SARPS:

BASIC PHILOSOPHY



Situation in the World

- **I C A O Standard**:
  - **Mandatory carriage of an ACAS II** (TCAS II version 7):
    - Since 1 Jan 00 for civil turbine-engined aircraft with more than 30 pax or weighing more than 15,000 kg
    - Since 1 Jan 05 with more than 19 pax or weighing more than 5,700 kg
  - ***So by fitting TCAS II, the Helicopter is afforded the same 'safety net' as an airliner (B737, B747, A319 etc)***

Why do we need it?

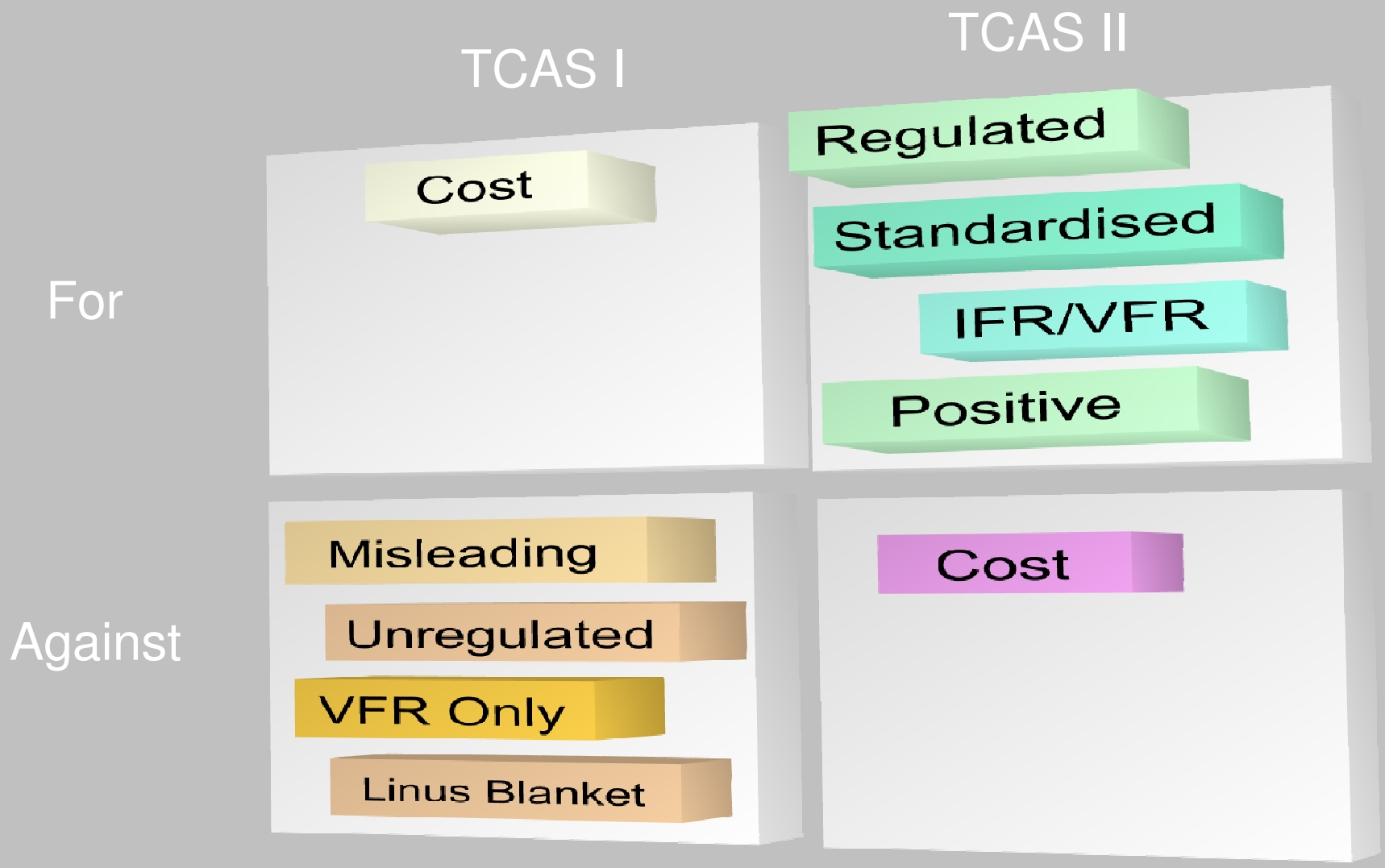
- **Airprox** – *a growing problem*
  - EC155 vs B206 - Port Harcourt
  - AS332 vs F3 - 120nm SE ABZ
  - AS332 vs AS332 - Scatsta
  - AS332 vs Nimrod - Kinloss
  - AS332 vs AS332 – Aberdeen
  - AS332L2 vs Tornado GR4
  - Nigeria 30+

To Summarise

FLIGHT TEST RESULTS

- **Flt 1 - S Puma V S Puma**
  - Head-to-Head
  - Slow Overtake
- **Flt 2 – S Puma V BAE 146**
  - Head-to-head
  - Overtake
- **Flt 3 – with CAA**
  - Performance Issues

TCAS I or TCAS II?



What was done?

What was done?

What was done?

How Does It Work – The Theory

- An airborne equipment that interrogates adjacent SSR **transponders**
- Collision avoidance criterion based on **time**
- Can detect some targets at more than 40 nm
- Can process at least 30 aircraft
- **Designed for *collision avoidance* only**

How Does It Work – The Theory

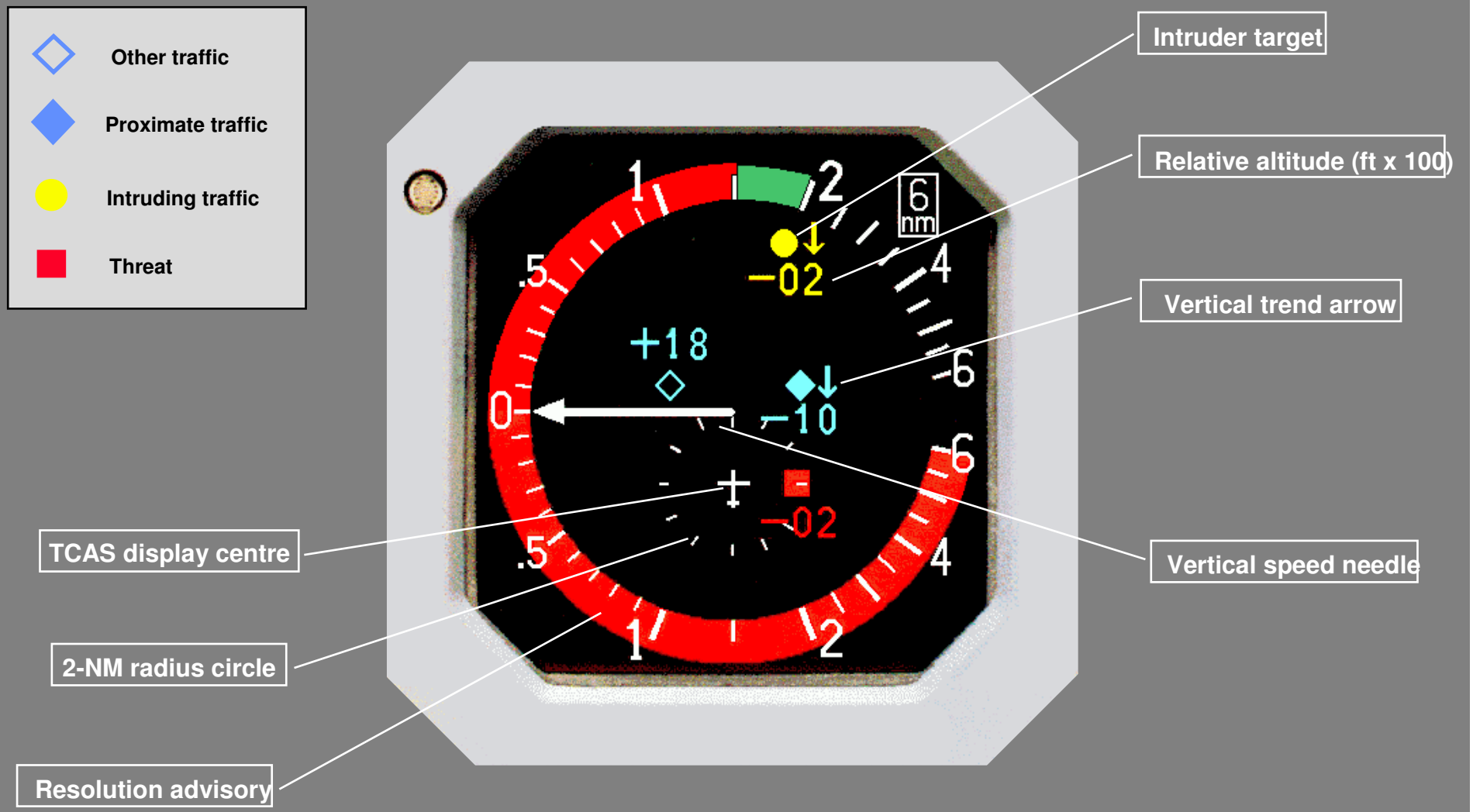
- ***Processing cycle = 1 second!***
- **Determination of the alerts:**
  - Traffic Advisory
  - Resolution Advisory
  - Co-ordination between two TCAS II units

  Information to the pilot:
  - Aural annunciations
  - Traffic display
  - Resolution advisory display

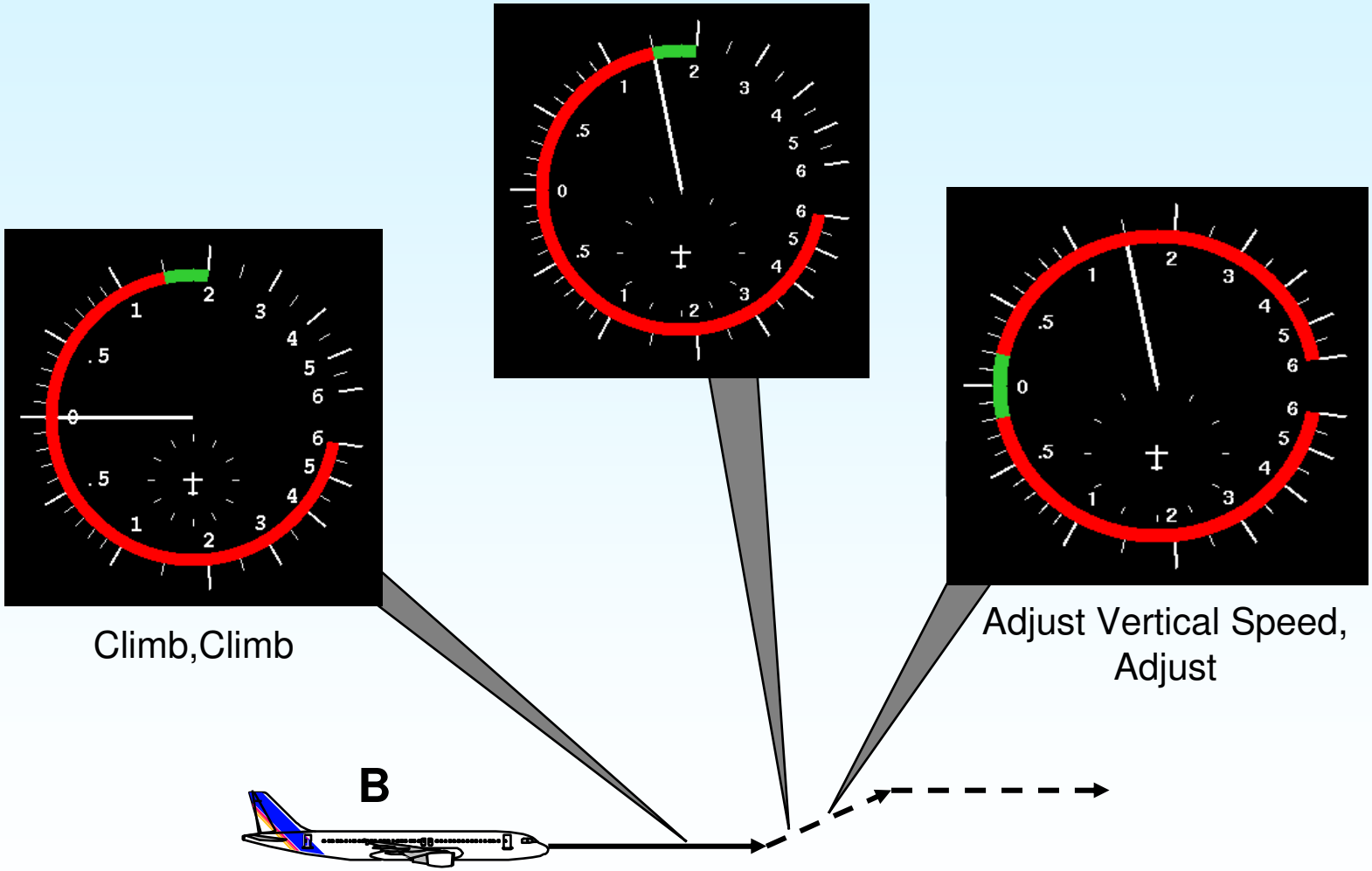
How does it work? - Initiation of Alerts - RA

- An RA indicates the ***vertical*** speed required to avoid a possible collision
  - If an RA is generated, the RA sense is selected:
    - to achieve a safe vertical distance (ALIM) at CPA
    - in coordination with the other TCAS equipment
- An RA takes *all* existing threats into account
- If the intruder does not report altitude: ***No RA***
  - UK military have agreed to squawk (with 'C') in the N Sea area unless;
    - Involved in covert operations
    - Major exercises (NOTAM)
    - Equipment u/s

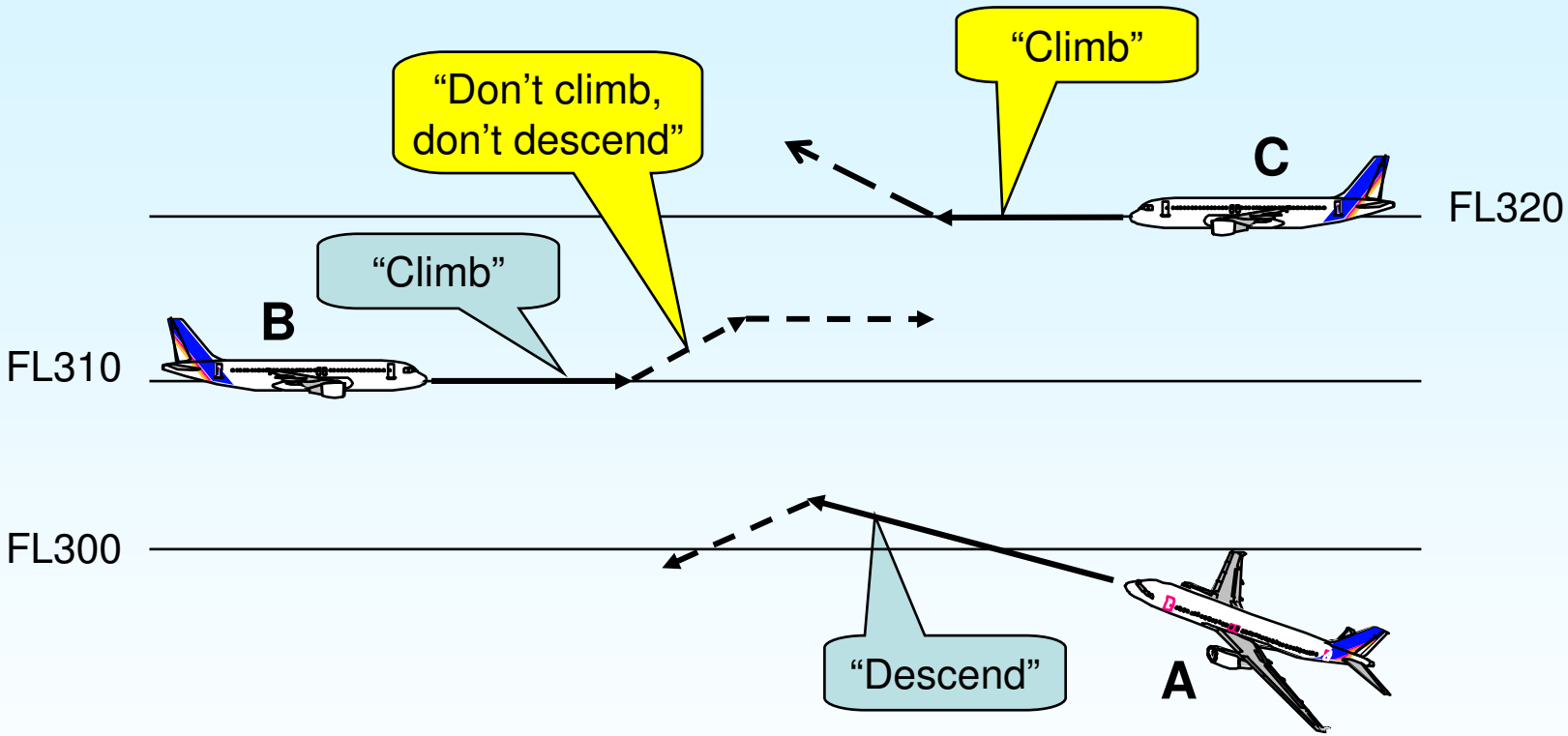
How Does It Work – practically IVSI-type TCAS display
(standard instrumentation)



How Does It Work – practically
Multiple Threat Encounter (1)



How Does It Work – practically
Multiple Threat Encounter (2)



The TCAS manoeuvre for B induces a conflict with C. The RA for B changes from "Climb" to "Don't climb, don't descend » (multiple threat RA).

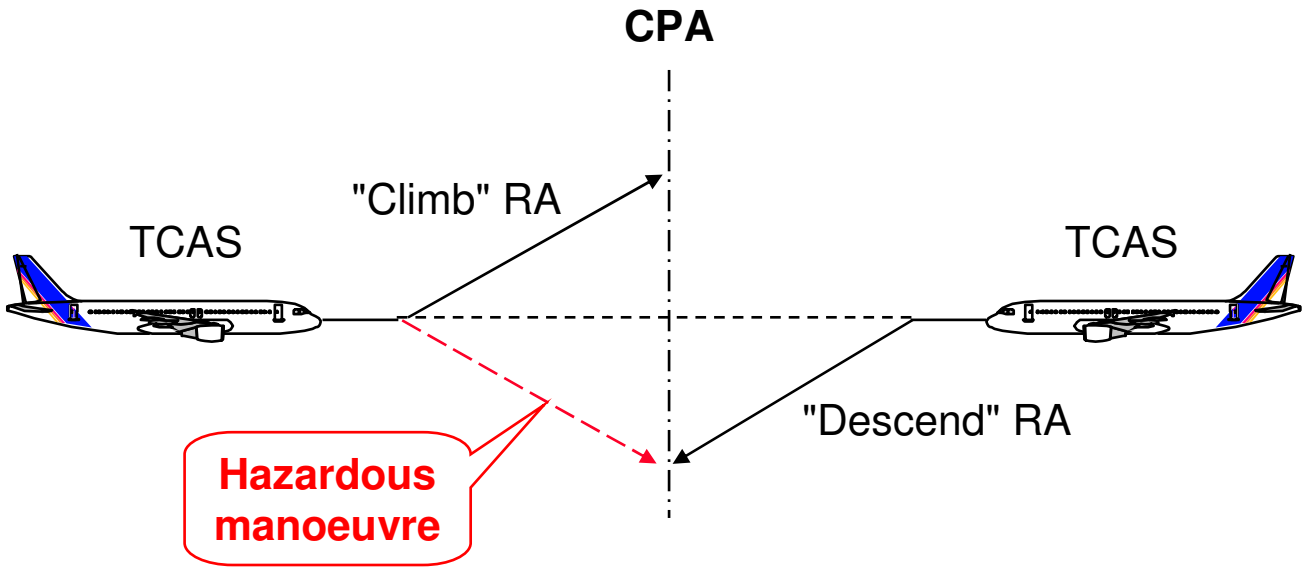
TA and RA Thresholds

		TA			RA			
FL or « Z » Radar altimeter	**SL**	**TAU (s)**	**DMOD (NM)**	**ZTHR (ft)**	**TAU (s)**	**DMOD (NM)**	**ZTHR (ft)**	**ALIM (ft)**
FL50 ~ 100	5	40	0.75	850	25~20	0.55	600	350
2350ft ~ FL50	4	30	0.48	850	20~18	0.35	600	300
1000 ~ 2350ft	3	25	0.33	850	15~15	0.2	600	300
0 ~ 1000 ft	2	20	0.3	850	**No RA**	**No RA**	**No RA**	**No RA**

Inhibits

- **Resolution Advisory**:
  - All: < 1,000 ft AGL (+/- 100 ft) *
  - Descend: < 1,100 ft AGL (+/- 100 ft) *
  - Increase descent: < 1,550 ft AGL (+/- 100 ft) *
  - Increase climb: hard wired (Increase climb Inhibit)
- **Annunciation**:
  - Own altitude: < 500 ft AGL (+/- 100 ft) *
- **Aircraft on-the ground**:
  - Mode **S** intruder:
    - aircraft-on-the-ground indicated in Mode S

RAs are coordinated !



When the TCAS is activated on-board both aircraft, RAs are **coordinated.**
The pilot should not, <u>in any situation</u>, manoeuvre contrary to the RA.

RA - Regulatory Context:- Pilots

- cf. docs ICAO PANS-OPS 8168
- The pilot **may depart** from the ATC clearance (or refuse it) to follow an RA
- The pilot must comply with his airline operational instructions. The pilot always retains the ultimate responsibility for his flight
- Following an RA is **similar** to an ordinary evasive manoeuvre: the use of TCAS does not alter **respective responsibilities** of pilots and controllers

RA - Regulatory Context:- Controllers

- cf. docs ICAO PANS-ATM 4444
- Following an RA is **similar** to an ordinary evasive manoeuvre: the use of TCAS does not alter **the respective responsibilities** of pilots and controllers:
  - The controller is **no longer responsible** for separations during a deviation due to a response to an RA
- "*When a pilot reports a manoeuvre induced by an ACAS resolution advisory, the controller shall not attempt to modify the aircraft flight path [...] but shall provide traffic information as appropriate*"
- The controller **must *not* consider** the use of TCAS equipment on-board aircraft to establish and/or maintain separation

Summary

- **Independent** system, that acts as a last resort
- **Highly accurate** altitude data (processing in 25 ft increments)
- **One per second** update rate
- TCAS-TCAS **co-ordination**
- **All threats** taken into account
- **Detection** of all transponding aircraft, including those which are not displayed on the controller's screen
- **Bristow is developing and fitting TCAS II upgrades to several types.**

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  - AFDS
- Type 2
  - HUMS
  - HOMP
  - **TCAS II ?**

G-TIGE

The First & Only TCAS II Equipped Helicopter

In The World!