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Airborne SAFNET in Real Time Operation

26 years of RA Downlink.
The world has moved on. Have we?

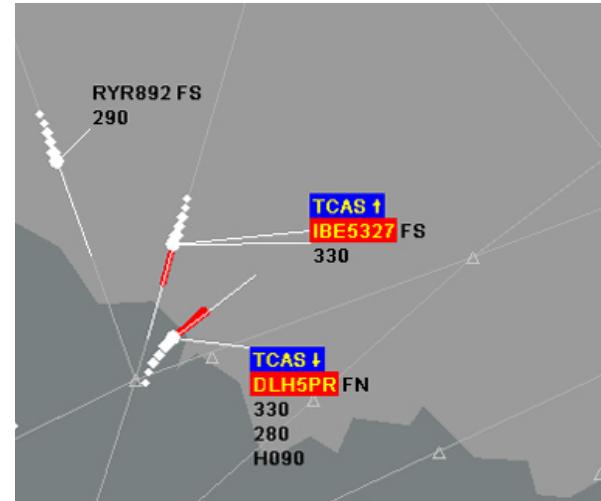
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RA downlink

- When there is a risk of midair collision TCAS will issue an RA in the cockpit to resolve the conflict.
- RA downlink allows display of RA information on the controller screen.
- Potential benefits of RA downlink include:
 - Reduced likelihood of contradictory clearances.
 - Improved situational awareness.

Let's review the history of RA Downlink...



1990

- First TCAS II MOPS published:

[...] The TCAS can provide the Mode S ground system with the resolution advisories that are displayed to the pilot. These resolution advisories may be displayed to the air traffic controller if desired. [...]

2016

- PC: Windows 3.0
- Cell phones worldwide: 11 million
- Internet users worldwide: 3 million



1990

1994

2016

- First investigations of technical and operational feasibility of downlinking TCAS RAs for display to air traffic controllers
 - France
 - USA
- Seen as potentially beneficial
- Implementation considered technically unrealistic at the time
- Unresolved issue of responsibility

- PC: Windows 3.1
- Cell phones worldwide: 56 million
- Internet users worldwide: 10 million



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1990

2001

2016

- Yaizu (Japan) accident
 - B747 and Dc10 narrowly miss each other
 - 100 injured
- Technical trials commence in Japan
- Controllers opinions split about the usefulness
- PC: Windows 2000
- Cell phones worldwide: 960 million
- Internet users worldwide: 480 million
- Introduction of iPod



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- Überlingen (Germany) midair collision
 - B757 and Tu154
 - 71 dead
- Investigators recommend: *To enhance the performance of ACAS ICAO should initiate the development of down-linking RAs to ATC [...]*

- PC: Windows XP
- Cell phones worldwide: 1.2 billion
- Internet users worldwide: 570 million



1990

2006

2016

- EUROCONTROL FARADS project
- 1st RA Downlink workshop:
 - RA downlink is technically feasible
 - Decreases the likelihood of contradictory clearances
 - Improves controller's situational awareness
 - Benefits cannot be quantified
 - Unresolved issue of legal responsibility
 - IFATCA critical of RA Downlink

- PC: Windows Vista
- Cell phones worldwide: 3.4 billion
- Internet users worldwide: 1.1 billion
- Introduction of iPod 5th generation



- First implementations of RA downlink
- Beginning of SESAR work on RA downlink
- 2nd RA Downlink workshop:
 - Early adopters share their experience with the community
 - Legal responsibility still unresolved
 - IFATCA critical of RA Downlink
- PC: Windows 7
- Cell phones worldwide: 4.6 billion
- Internet users worldwide: 1.8 billion
- Introduction of iPod Nano 5th Generation



- Early adopters report that RA downlink is not a game-changer.
 - Controllers almost unanimously wouldn't like it removed from their screens
 - There is both practical experience and scientific evidence that RA downlink increases situational awareness.
- Still, RA downlink is used “for information only” owing to the lack of ICAO provisions.

- PC: Windows 8
- Cell phones worldwide: 6.7 billion
- Internet users worldwide: 2.8 billion
- Introduction of iPad Mini



- RA Downlink part of baseline systems by several manufacturers
- Several ANSP undecided whether to use RA Downlink or not (corporate responsibility)
- SESAR RA Downlink studies inconclusive

- PC: Windows 10
- Cell phones worldwide: 7.1 billion
- Internet users worldwide: 3.4 billion
- Introduction of iPad Pro



RA downlink is still where it was 26 years ago

- Community still split on utility of RA Downlink
- Unresolved issue of responsibility
- Lack of ICAO provisions

Technology developed...

- From Windows 3.1 to Windows 10
- Cell phones worldwide: from 11 million to 7.1 billion
- Internet users worldwide: from 3 million to 3.4 billion
- From iPod to iPad Pro

The world moved on... Why can't we?!



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