See who is talking!

by Tom Goossenaerts

Several ATC occurrences find their origin in the gap between the situation as perceived by the Controller and the real air traffic situation picture. The causes leading to this misinterpretation are various in nature. The consequences however are usually the same: a lot of precious time is lost before the ATCO has a correct view on the situation...

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has a MSc in telecommunications technology and has worked on various – mainly military – avionics systems and on ground-based communications equipment for several years. He joined EUROCONTROL in 2005 as team leader of the Voice Communications Team at MUAC. In 2010 he moved to the project management unit where he became responsible for leading the NVCS project, the joint DSNA-MUAC EUROCONTROL procurement initiative.

I know that this is a stop gap solution to reduce misunderstandings, but I'm looking forward to the day when we'll have CPDLC…

Not rarely drastic measures are needed to ensure adequate separation. The effects here are both safety risk and impact on the workload of Controller. Additionally one can argue that this creates an impact on the workload for Pilots as they are at the end of the separation assurance chain.

But what are the typical scenarios we are talking about?

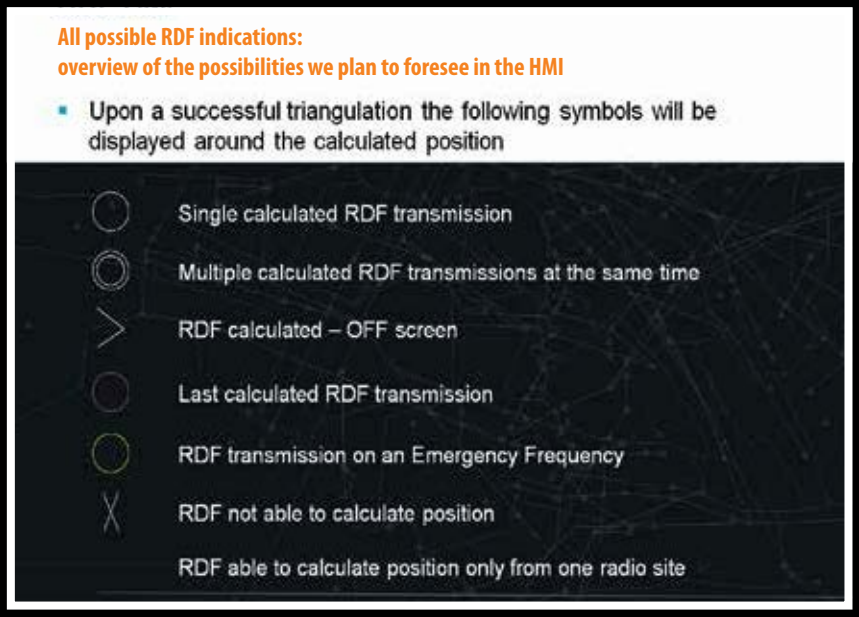
A typical case in which such incorrect image is mistakenly taken for the correct one is 'callsign confusion'. A Controller issues a clearance to an aircraft yet a different aircraft replies, assuming the clearance was intended for him. The pilot of the first A/C may not react since both the ATCO and the pilot of the second (replying) A/C are under the assumption that they were communicating to the correct party. Neither of them is correct however. Alternately, both aircraft pilots reply simultaneously and the incorrect reply is masked on the frequency and not noticed by the Controller. The situation initially passes unnoticed, still often results in a single or even a double conflict (the instruction is followed by the not intended aircraft and not followed by the intended one). In a number of cases a second conflict kicks in as the second A/C is following an unintended trajectory.

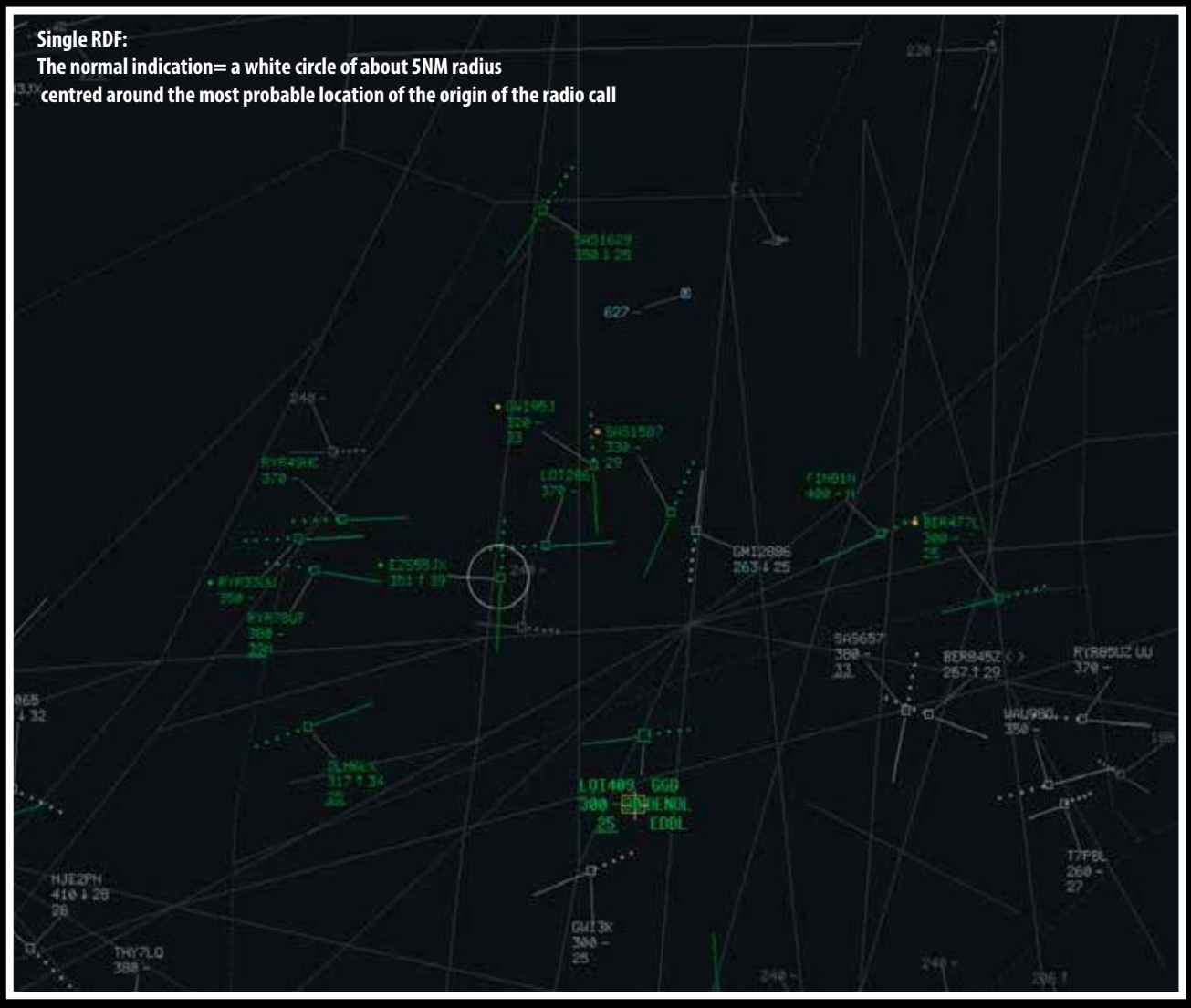
Another case, irrespective of similar callsigns, is a mental confusion by the ATCO of the aircraft addressed. The ATCO looks at an aircraft, gives instructions to it and manipulates the flight data of it seeing its callsign but always considering it as another one. It may seem like an impossible scenario since all information is correctly displayed; still it happens. Moreover it is one of the most dangerous ones as the read-

back is correct from the correctly addressed aircraft but not the from the intended surveillance target the ATCO was focusing his attention at.

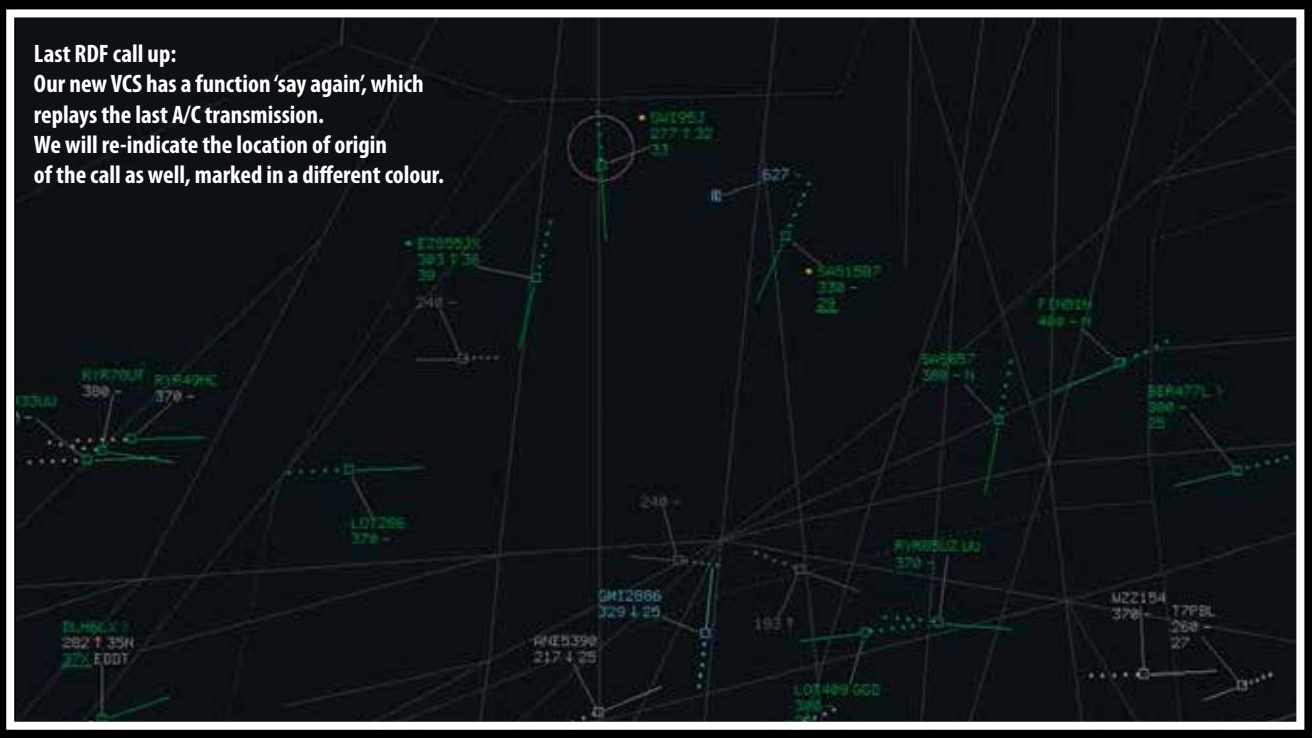
As demonstrated, a major drawback of ATC communications is the fact that voice communications are still the ATCO's primary tool for providing clearance instructions. Whereas the radar screen displays a very accurate air traffic picture, the ATCO has absolutely no visual feedback with respect to the originator of a pilot-to-ATCO voice call.

Presentation on CWP:





See who is talking! (cont'd)



We all know the drawbacks of air-ground communications, but is there any reliable solution on the horizon, apart from telling the Controllers to be more careful when they speak and listen?

One way to increase the awareness of the ATCO in the area of voice communications, and hence to prevent conflicting situations rather than to resolve them, is to provide the ATCO with fast, clear and accurate information on the area where a radio call has been initiated from. In other words – to help the controller to see who is talking and to increase the reliability of the detection by combining audio and visual perception information streams.

ATC radio calls transport no other information than the RF carrier and the 2 amplitude-modulated sidebands containing the voice signals. As a result it is impossible to extract any geographical information directly from the signal. This information will therefore have to be produced in an indirect way.

One means to bring forward this information consists of an array of Radio Direction Finders (RDFs) working together. The technology behind Radio Direction Finders is nearly as old as radio itself: radio beam tracking devices have been available on the market for many years.

Nevertheless, only few implementations are known in which the information of multiple individual radio direction finders is combined to provide a continuous flow of triangulated positions.

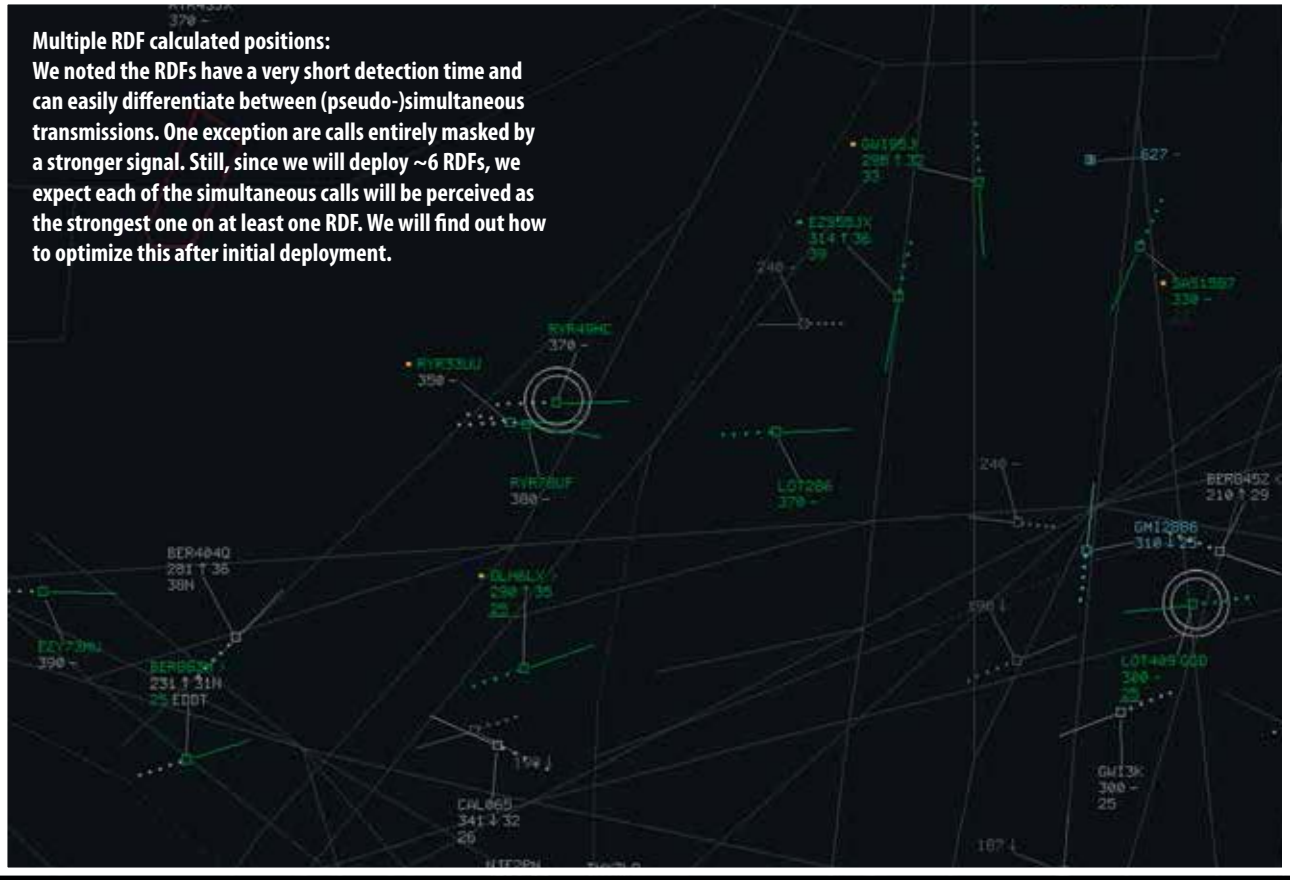
MUAC launched a dedicated project to implement Radio Direction Finders of the current generation, capable to provide a fast and accurate calculated fix of a transmitting aircraft and as such to deliver the operational benefits.

MUAC has executed some tests with RDF devices installed on 2 sites and this on limited as well as full capacity. Having a good system may be totally jeopardised by a dysfunctional HMI. Ultimately, the already overloaded surveillance screen of the Controller should also integrate the new information. Here after are some screen shots to demonstrate how the concept of RDF would appear in the "real world".

We often tend to think that if you do something it is for a single reason, that there are single causes explaining the events and actions. This way of thinking can be also sometimes deduced from conversations and discussions about investments in ATM system. We either invest in system functionality to improve efficiency and reduce flight delays or in safety nets and safety-supporting features. But sometimes we can "hit" both objectives. Having RDF functionality is one of these examples. It clearly supports safety and it helps at least one routine and frequent task of the Controller – to identify where the communication originates. Reducing the cognitive effort for this task and decreasing the time required for sure helps the controller to be more efficient with all the other circumstances being the same.

And, yes, I am talking to you Decision Makers – help the Controller to see who is talking. This is not a small talk.

Multiple RDF calculated positions:
We noted the RDFs have a very short detection time and can easily differentiate between (pseudo-)simultaneous transmissions. One exception are calls entirely masked by a stronger signal. Still, since we will deploy ~6 RDFs, we expect each of the simultaneous calls will be perceived as the strongest one on at least one RDF. We will find out how to optimize this after initial deployment.



Off screen call:
small arrow indication there was a detection but it is outside the visible area.