



In an emergency, pilots should be able to talk directly to ARFF as well as ATC.

# TRIPLE PLAY

BY FLORIAN GROSCH

An incident involving an Airbus A330 at Düsseldorf, Germany, demonstrates the advantages of an advanced emergency communication (ERCOM) system.<sup>1</sup> While the aircraft was in flight, the captain declared an emergency because of a fire at door 2 left. The first officer independently called the aircraft rescue and firefighting (ARFF) unit,

which also was alerted by air traffic control (ATC) because of the declared emergency. The ARFF unit prepared accordingly.

Agreements were made about where the aircraft would stop after it landed and the preparations to be made by the flight crew. After the aircraft landed, the ARFF unit was able to immediately approach the affected door from

outside with an infrared camera and report directly to the flight crew that there was no longer a fire.

Following the incident, the captain said the information from the ARFF unit contributed to an easing of tension and to his decision not to conduct an evacuation. Also, he recommended that ATC should inform flight crews about the possibility of communicating



A test of advanced emergency communication demonstrated its advantages, but procedures need more work.

with ARFF, which a flight crew might overlook because of the stress level. The first officer said that, because of the presence of ARFF personnel and equipment around the aircraft, it would have been necessary to inform ARFF before performing an evacuation, because of the dangers to firefighters from deploying evacuation slides.

The results of a German test of the introduction of a direct radio communication link between ARFF and flight crews also confirm the advantage of the advanced ERCOM. Five German airports — Frankfurt, Cologne, Düsseldorf, Hamburg and Munich — are participants in the test phase. In the first year of the test, which began in April 2010, 45 contacts were reported between ARFF and flight crews via direct radio communication. The use of an advanced ERCOM proved to be useful in various abnormal situations.

On July 1, 2012, the *Feuerwehrfrequenz* (the German word for emergency communication frequency) will finish its test phase and be introduced officially. The frequency will be 121.550 MHz. The airports will have until 2014 to prepare for English language usage in the system.

Communication management is essential in safe air traffic coordination and ARFF operation. The operation, transmission and receiving of information are based on coordinated standard procedures, phraseology and language, which influence the decision-making processes of the participants.

This also applies to an emergency on the ground, when an advanced ERCOM enlarges the circle of involved parties. No longer is it just from flight crew to ATC. Now the loop consists of flight crew, ATC and ARFF. In this new and dynamic situation, quick and reliable information is an advantage for all participants and improves safety, preserves equipment and reduces costs.

Despite all the safety developments in aviation, there has been no real progress toward widespread adoption of an ERCOM, though several studies and accident reports have recognized its advantages. In 1998, the U.S. National Transportation Safety Board (NTSB) published

a safety recommendation that says, “The [U.S.] Federal Aviation Administration (FAA) should establish a designated frequency at all airports certified under [U.S. Federal Aviation Regulations] Part 139 that allows direct communication between ARFF personnel and flight crewmembers.”<sup>2</sup>

Even within states, the levels of emergency communication facilities differ. For example, in Switzerland, only Zurich airport, which is used by commercial air traffic, offers the possibility of a direct radio communication link between ARFF and a flight crew, and the service is available in German only. This results in different levels of emergency communication standards and procedures, the majority of which are not as efficient as possible. Only two states — the United Kingdom and Australia — were identified as having a countrywide direct communication link between flight crews and ARFF. Both countries use English as their official language, which facilitates the communication.

The most widely used ERCOM system routes all communication through ATC — a system I call the *communication triangle* (Figure 1, p. 44).

The triangle system fulfills the minimum task of integrating the acting parties. However, the system involves weakness for all participants. The indirect connection between ARFF and flight crew decreases the speed of information flow and increases the possibility of information being misunderstood. Additionally, ATC has to coordinate traffic, besides conveying emergency information. Both tasks take place on the same radio frequency.

However, ATC cannot be excluded from the communication triangle, because it is in contact with all resources. As the airport’s traffic coordinator, it needs to be aware of the situation and its development. It has to remain a part of the information exchange without creating additional problems.

The principle of direct communication between ARFF and the flight crew is not new, but there exists no standard for the content or requirement for direct communication in an emergency.



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Based on analysis of incident reports, the German test of this system proved an advanced ERCOM highly effective in the accomplishment of the rescue mission. It allows a more efficient rescue operation through a faster information exchange between ARFF and the flight crew (Figure 1).

The system keeps ATC in the communication loop but in a passive position. This means that the ATC frequency and involved personnel gain more communication capacity by transferring the ERCOM voice transmissions to a separate radio frequency. The standard airport traffic frequencies remain unaffected. As a backup, it is still possible to return to the communication triangle via ATC if necessary. Technically, the system is easy to integrate and can be used with existing equipment. The biggest investment in training and radio equipment has to be made by the ARFF unit.

Both ARFF and flight crews profit from the improved information exchange, which is more flexible and faster. Both ARFF and flight crews have access to first-hand information about the external and internal condition of the aircraft. This allows them to more quickly get the total picture and coordinate their next steps.

Coordinated measures reduce environmental dangers. Running engines and the unexpected activation of evacuation slides with ARFF personnel nearby pose serious risks for ARFF. Coordination

also helps to avoid situations where specific aircraft procedures require completing certain steps, such as engine shutdown and setting flaps, before external arrangements are made.

Similar dangers, involving proximity to ARFF heavy equipment and extinguishing devices, exist for passengers during and after evacuation.<sup>3</sup> Those dangers are reduced by an agreement about evacuation speed.

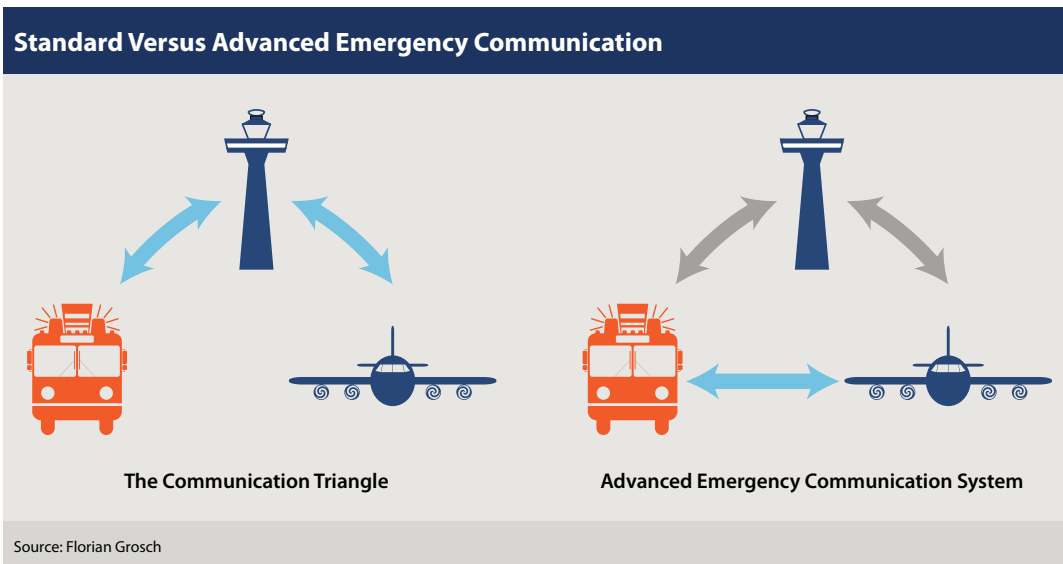
Controlled evacuations, which are conducted less quickly when there is no immediate danger, pose less injury risk than normal evacuations. In the Airport Cooperative Research Program report, *Evaluation and Mitigation of Aircraft Slide Evacuation Injuries*, ARFF personnel noted that when there is no imminent danger, coordination between the flight crew and ARFF personnel is needed to control the flow and speed of passenger evacuation.<sup>4</sup>

The analysis of the 45 communication events through DFS, the German air navigation service provider, highlights the advantages identified under actual emergency conditions for the fast establishment of a direct communication link between ARFF and flight crewmembers (Table 1).<sup>5</sup> Affected flight crews repeatedly said they welcomed the existence of such a system.

A direct information exchange about the situation and the actions taken avoided four

evacuations. In two of these cases, a hydraulic failure and a cabin smoke incident, ARFF and flight crews maintained the communication even as an aircraft taxied toward the parking position.

Problems that appeared during the test highlight the need for regular inspection of the ARFF radio equipment, the development and publication of standard



**Figure 1**

procedures and the examination of airport radio coverage characteristics.

During the test phase, radio equipment failure and the inability to select required frequencies sometimes remained unnoticed, which led to a correction of the daily equipment check procedure. Too much noise in the ARFF vehicle hindered the communication and even led to missing a flight crewmember's call. ARFF vehicles were equipped with up to five different radio frequencies, selected by a single switch. As a consequence, a change in the method of activating radio frequencies and a volume control feature are being reviewed.

Being unfamiliar with ERCOM standard procedures led to a delay in ARFF alerting, because the flight crew had used only the ERCOM frequency for an initial call. Unclear rules of responsibility caused frequency congestion, as different ARFF units tried to establish contact with the flight crew on the ERCOM frequency. This highlights the need for clear responsibility and a planned, coordinated procedure at bigger airports that have more than one responding ARFF unit. Frequency overlapping was identified as a problem at Hamburg, which hindered communication there.<sup>6</sup>

During the test, no language problems were reported. Because the test was conducted in German and involved only German airlines, using the local language posed no difficulties to the participants. In the future, the goal is to make ERCOM available to all airlines and expand it to more airports. A sufficient level of English language knowledge and an understanding of multi-language communication principles will then be necessary.

The investment necessary for installation and operation of an advanced

ERCOM system is small compared with the benefit. Because the system uses existing radio equipment installed in the cockpit, no investment is necessary for airlines. To comply with International Civil Aviation Organization standards and recommended practices, the necessary technical equipment to record the emergency communication is included in the investment calculation. The recording not only serves as evidence for accident/incident investigations, but also is helpful for ARFF training and analysis. Depending on the equipment already installed as well as technical capabilities, the task of ERCOM recording can be taken over by ATC.

ARFF has the highest proportion of the costs. It has to invest in training and equipment. The head of ARFF Stuttgart calculates costs of €15,000–€20,000 (US\$19,000–\$25,380) for acquisition, installation of radio and a suitable recording system. A further €5,000 (US\$6,345) is estimated for English language training of ARFF personnel.<sup>7</sup>

Although the advantages of an advanced ERCOM system are known and confirmed through accident/incident reports and studies, it must become clear to decision makers that advanced ERCOM, if applied efficiently, can offer greater safety for people, protection for equipment and lower costs. ➤

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### Advanced ERCOM System Incidents During Test at Five German Airports

Reason for Communication	Number of Incidents	Percentage of Total
Landing gear	13	28.9%
Fire/fire report	6	13.3%
Smoke in the cockpit	6	13.3%
Hydraulic failure	5	11.2%
Smoke in the cabin	4	9.0%
Engine failure	2	4.4%
Bird strike	2	4.4%
Fuel leak	1	2.2%
Flight control	1	2.2%
Rejected takeoff	1	2.2%
Unknown	4	8.9%
<b>Total</b>	<b>45</b>	<b>100.0%</b>

ERCOM = emergency communication  
Source: Florian Grosch

**Table 1**

#### Notes

1. Incident: Air Berlin, A33-3 at Düsseldorf, Aug. 15, 2011, fire on board, <avherald.com/h?article=44528d0c&opt=0>.
2. NTSB, Safety Recommendation A98-41-42, June 25, 1998.
3. ARFF Frankfurt, German Commercial Pilot Forum, Frankfurt am Main, Germany, March 28, 2011.
4. Airport Cooperative Research Program (ACRP), Report 2, *Evaluation and Mitigation of Aircraft Slide Evacuation Injuries*. Washington, D.C., 2008, p. 19.
5. DFS, Presentation Feuerwehrfrequenz, May 2011.
6. Telephone interview with ARFF Hamburg, June 11, 2011.
7. Rudloff, A., head of ARFF Stuttgart, via email, June 9, 2011.