GA COLLISION RISK -

INTEROPERABILITY OF ELECTRONIC CONSPICUITY SYSTEMS

Report on the implementation of interoperability solutions and the related action plan: D-4

Version control

Version	Approved by and when	Remarks
1.2		

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1. Introduction and background

The considerations for this document have been prepared in conjunction with previous parts of this project and should not be published as a stand-alone document.

In Deliverable 3.1 three case studies of the main transmission paths for e-conspicuity (1090 MHz, SRD 860, and mobile network) were presented and evaluated. The evaluation was done based on feasibility of the proposed interoperability requirements for e-conspicuity derived in workshop two. Additionally, three deployment scenarios were identified that could enable implementation for all aviation participants while maximising the use of existing equipment. The influence of unmanned aviation on developments in the field of e-conspicuity was also examined. In conclusion of the case studies, an action plan was drawn up showing the necessary steps for implementing e-conspicuity and the ADS-L protocol in General Aviation.

In Deliverable 3.2 the assessment of additional benefits for airspace and ground users through harmonised data exchanges, including the availability of additional (stored) traffic data for search and rescue operations, the investigation of safety related events and safety trends, as well as the reuse of stored traffic data for training purpose was outlined.

One focus of the results and the most important point on the action plan was to inform the General Aviation community about the topic and to sensitise them to the issue of electronic conspicuity. The AERO Exhibition 2024 in Friedrichshafen was chosen as the starting point for this important step. At the event, Horváth and Droniq gave presentations and hosted panel discussions with the participation of EASA members and many different experts and stakeholders.

Furthermore, many discussions were initiated with manufacturers of hardware and software for e-conspicuity and new developments were discussed. Among other things, information is now available on specification two of the ADS-L4SRD860 protocol as well as hardware and software developments with integration of the ADS-L protocol. Besides the trade fair event, there have also been developments in the UAT and Mode N areas.

With the information obtained at the AERO as well as the information on actual developments a consolidation of the chosen solutions will be introduced in this document. An update of the action plan for the implementation of the interoperability requirements identified and the coordinated deployment of identified solutions by the different stakeholders will also take place. Finally, the issues that are not resolved and the remaining risks for implementation will be pointed out.

2. Conclusion of and response to the case studies (D3.1 & D3.2)

In the three presented case studies, the transmission paths 1090 MHz, SRD 860, and mobile network were examined regarding the interoperability in e-conspicuity. Within the individual case studies, the interoperability requirements determined in the second workshop were checked for feasibility, constraints, and costs. In all considerations it must be clear that e-conspicuity shall support the situational awareness of pilots; it is not to be used as surveillance supporting ATC.

The individual transmission paths are not directly compatible and do not speak the same language as the protocol. Therefore, the only way to achieve interoperability is to optimise the individual paths and bring them together with a common language, e.g., ADS-L, in the network and through combined (Multilink) devices.

Transitioning from existing Mode-S transponders to ADS-B presents a clear path to significantly enhance visibility and traffic awareness. This transition aims solely at upgrading existing devices to transmit their precise positions via ADS-B, rather than introducing new 1090 MHz users. Typically, this upgrade involves installing a GNSS source, such as electronic conspicuity systems with GNSS interface, onto existing hardware. Additionally, implementing alternative solutions like supported exchange programs and introducing low-power ADS-B options should be explored.

Integrating 1090 traffic data into connected traffic networks would benefit aircraft utilising different transmission paths, such as the ADS-L protocol, as current transmission, and reception of ADS-L on 1090 MHz is unfeasible due to complex hardware changes necessitated by licensing and approval requirements. Receiver stations can be established through a combination of professional and community resources, facilitating the precise localisation of Mode-S transponders via MLAT, particularly for aircrafts that cannot be updated or should not be updated.

Discussions during the second workshop underscored uncertainties regarding the reliability of mobile networks as a transmission pathway for e-conspicuity messaging, contradicting assertions made by service partners like SafeSky, which advocate for mobile network-based solutions. Considerations regarding performance parameters for seamless connectivity are paramount.

SRD860 devices enjoy widespread popularity within General Aviation, as they are used as permanent cockpit installations as well as mobile devices, such as those used by paragliders. Operating on a specific frequency, they possess a limited range and support both air-to-air and air-to-ground communication. Leveraging existing and emerging SRD860 technology for the implementation of ADS-L represents the optimal and most straightforward path to achieving interoperability through this new protocol. Existing systems can undergo upgrades and retrofits up to a certain age. While the integration of various technologies and frequencies within the SRD860 band facilitates the technical realisation of transmission, reception, and relay operations, it also presents significant technical hurdles.

Foremost, completing the specification for ADS-L protocol for SRD860 is imperative, alongside initiating the development of ADS-L4Mobile specification concurrently. This serves as the foundation for crafting devices tailored for general aviation. Financially, SRD860 devices incur no registration or authorization costs and minimal licensing fees. Upgrading to ADS-L will be cost-effective, although the full range of new functionalities offered by ADS-L will only be accessible to new devices.

Mobile network data services operate as shared resources, susceptible to overload. Lower airspace coverage by mobile networks is not an intended feature; it relies on unintentional reflections for coverage. Mobile network operators are hesitant about airborne users due to unintended neighborship relations between network cells.

While enabling mobile network usage onboard an aircraft or by airspace users would notably enhance e-conspicuity situational awareness, unlocking a broader spectrum of traffic information sources currently inaccessible to users. The success of such a solution hinges on the simultaneous establishment of a server infrastructure for e-conspicuity message communication and rebroadcasting to connected users.

EASA must mandate the development of an ADS-L4MOBILE specification to incentivise manufacturers to invest in hardware or retrofit solutions for e-conspicuity message transmission. Additionally, EASA must assess the costs associated with developing, installing, and maintaining a suitable server infrastructure.

In contrast to air-to-air broadcasting communication employed by electronic conspicuity device users, communication via mobile networks or internet connection relies on a centralised data platform with the following functions:

a. Receiving e-conspicuity messages and other air traffic information sources.
b. Processing and filtering messages based on user location.
c. Rebroadcasting messages through multiple communication paths, such as mobile networks.

Without an appropriate server infrastructure and continuous system monitoring, the mobile network communication pathway offers no advantages for e-conspicuity message transmission.

3. Actual e-conspicuity progress

3.1. Influences of AERO 2024

The AERO Expo is an annual trade show for General Aviation held in Friedrichshafen, Germany. It is one of the leading events for the General Aviation community, providing a platform for manufacturers, suppliers, service providers, and enthusiasts to showcase and explore the latest technologies, products, and trends in general aviation. The expo covers various sectors including aircraft, avionics, accessories, services, and training. AERO attracts participants from around the globe and offers networking opportunities as well as expert talks and workshops.

AERO was used as a starting point for EASA to discuss electronic conspicuity and ADS-L with the General Aviation community.

The project participants organised several panel discussions and presentations. There was a lively, professional exchange within the framework of the Safesky project in Aachen, which is concerned with the development of a traffic network based on UAT technology. There were also active discussions at association level about increasing the level of knowledge among pilots and integrating the topic into pilot training. The public stage discussions were very effective in drawing attention to the topic and presenting the planned approach. They also showed that the information deficit identified in the project survey is present. Associations, manufacturers, and pilots constructively discussed the future of e-conspicuity.

New developments, future technologies and devices were also presented at the AERO trade fair. Some of these innovations, which are directly related to the project content, are presented in the following subchapter.

3.2. Hardware & software developments

At the AERO, new hardware and software developments were presented that integrate the interoperability requirements described and developed during the project, thus creating a better and more complete traffic situation picture. These developments bring the various transmission paths together, integrate the ADS-L protocol, simplify the installation and commissioning of an e-conspicuity system, and relieve frequency ranges.

This applies to both on-board transmitters and receivers, ground stations and conspicuity devices for unmanned aircraft. This chapter will show examples of new developments that integrate technologies that were considered and developed during the project and thus improve interoperability between the various systems. The companies and products mentioned have been selected solely based on their technological aspects and this does not constitute an advertisement for these products. This is only intended to show the ways in which the problem of interoperability can be solved. Furthermore, the prices mentioned are intended as an orientation for implementation for the broad mass of users.

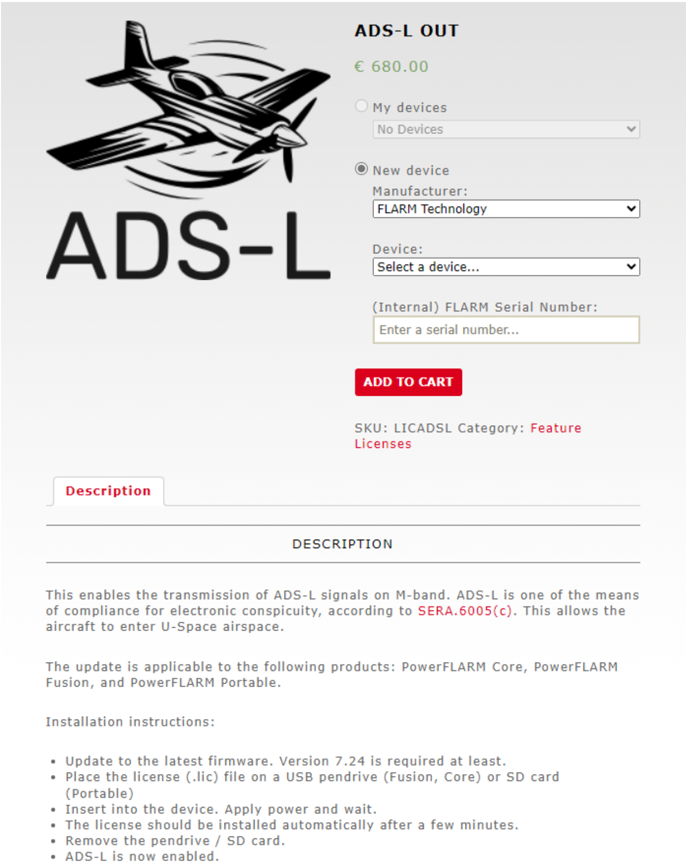
Avionix Engineering – Aero Tracker

At the AERO the company Safesky in collaboration with Avionix Engineering launched a transmitter box called Aero Tracker. The box includes a modem for mobile network with a SIM card working on all European networks. It transmits and receives ADS-L on 868 MHz and the Safesky protocol on mobile network. The box also receives ADS-B and Mode S on 1090 MHz and will be connected to a mobile device, e.g., mobile phone via Wi-Fi to display the traffic data received in the Safesky App.

It is battery powered with an endurance up to 6 hours and more. The problem with this device is that switching between national and international roaming partners can take up to 45 seconds and no transmission via the mobile network is possible during this period. The box is said to cost around €900.

Air Avionics will most likely launch a transponder in 2025, which is able to be switched to a TABS-Mode. In TABS (Traffic Awareness Beacon System) Mode the transponder will not answer the SSR requests from ATC but will be visible for TCAS systems and electronic conspicuity devices, as it replies to TCAS calls and transmits ADS-B data. This saves battery and relieves the capacity of the 1090MHz frequency band. The transponder will be very lightweight, and a certified GPS source is included, so no more external devices must be connected. This enables and simplifies the installation for users.

Air Avionics – Preview 2025



FLARM – Upgrade to ADS-L

FLARM now offers an upgrade of its newer devices to ADS-L out as a software solution on its website. Users can use it to upgrade devices from other manufacturers that use licensed FLARM modules to the ADS-L out protocol. This ensures compliance with SERA 6005(c) for entry into U-Space airspace even without ADS-B. The upgrade costs around €680. However, reception and transmission on the PilotAware frequency is not possible. From fall 2024, the PowerFLARM FLEX, which offers a collision warning device with ADS-B reception and FLARM transmission reception as well as a very compact format weighing just 300 grams, will be available. The device can be operated for up to 10 hours with a replaceable battery and has an integrated small display to show traffic. The device is an example of how some of the requirements for the interoperability of e-conspicuity devices can be solved. It is portable, so it can be switched between different aircraft, and it does not require the installation effort that many users shy away from.

FLARM – PowerFLARM FLEX

In the field of unmanned aviation, mainly for the operation of drones, transmitters have been developed that emit the ADS-L protocol together with the remote ID required for some drone applications. The picture shows the transmitters from Phinx Avionics. These small and very light devices can be used for drones as well as for lighter General Aviation. They can be used to visualize manned and unmanned aircraft, but lack a display to show the surrounding traffic, if using in manned aircraft.


Phinx Avionics transmitters

Furthermore, there are developments in the area of ground stations for the integration of ADS-L. Together with Safesky and OGN, Avionix now offers a ground station that can receive FLARM, ADS-B, ADS-L and even Remote ID from drones in all available frequency ranges. The received data is transmitted into the networks of OGN and Safesky.

Avionix – Ground Station

The developments shown here prove that the interoperability requirements and solution approaches identified in the workshops, technical meetings and case studies are being implemented in the industry. Both the integration of ADS-L and the merging of the various transmission paths show that the proposed solutions are the right way forward and can be further consolidated.

There were also i-conspicuity developments which were not shown on the AERO trade. The Avionix OGN Tracker and the Skytraxx 5 are shown below as examples. The OGN Tracker is advertised as the first fully ADS-L capable tracker (ADS-L in and out). It also has an ADS-B receiver section and an optional 4G modem, but no FLARM transceiver section. This means that it does not have full ADS-L functionality. Nevertheless, it is a multilink device that can be connected to all common navigation systems via Bluetooth, Wi-Fi, or cable. A future extension to FLARM or at least the ADS-L capability on FLARM frequencies is certainly technically possible.

In principle, the Skytraxx 5 has the hardware capability to transmit and receive ADS-L, but the function is not yet integrated. Like its predecessors, this device is mainly used by paragliders as a portable device.

Avionix Follow Me OGN Tracker

Skytraxx 5.0 with ADS-L ability

3.3. Further developments

Developments in e-conspicuity have also taken place apart from the AERO trade fair.

The Safesky app has already been presented as an example for the mobile transmission channel in the workshops and technical meetings. One problem with its use is the reliability and consistent usability of the mobile phone connection at different heights and at higher speeds. ADAC Luftrettung has now decided on a test phase for the integration of the Safesky app in rescue helicopters. For this purpose, the navigation tablets will be modified, equipped with the app and a mobile router approved for commercial aviation will be installed in the corresponding helicopters.

This solution is not representative for General Aviation because of the cost of the WI-FI router (over €50.000), but the test will provide valuable data for the applicability of such an e-conspicuity app in a professional environment.

ADAC Luftrettung chooses SafeSky to safely save lives.

© ADAC Luftrettung / PD Dr. Björn Hossfeld

Various initiatives are currently underway in the area of UAT transmission technology in Europe. This area was of secondary importance in the workshops and further discussions of the project due to the problem of allocating the required transmission frequency in different parts of Europe. The focus here is on military use by TACAN systems. UAT transmission is widely used in America in conjunction with ADS-B on 1090MHz and there are many transmitters available for General Aviation. A major added value of this technology is that additional information can be transmitted alongside traffic and conspicuity data. This includes weather, airspace, and airfield data, for example. This data is transmitted in FIS-B format, which is now also integrated into the ADS-L protocol.

Some countries in Europe, including the UK, Finland, Norway, and the Netherlands, are setting up a UAT network with ground-based transmitting and receiving stations. However, individual countries acting independently is not conducive to a Europe-wide introduction of UAT technology.

Three UAT transmitters have now been delivered as part of the Safesky project in Aachen, which will be using several UAT transmitters to send traffic data on a test field. One of these is now being examined in more detail by the Federal Network Agency in Germany before test operation can begin.

In workshop two, the developments around Mode N were presented. Mode N is a ground-based positioning system that can supplement or even replace GNSS systems. A major advantage is that the system is significantly better protected against spoofing thanks to the strong ground-based transmitters. This makes the system very interesting for military and civilian use. The installation of Mode-N could be used to free up the frequencies of the DME and TACAN systems in Europe and thus also enable the use of the 978 MHz frequency for UAT. The project is currently being supported by a team of experts from DFS and a test phase in a limited test field is planned. This development should be actively monitored so that the opportunity to use the UAT frequency is not lost.

3.4. Issue 2 of ADS-L4SRD860

The development of Issue 1 of ADS-L4SRD860 was completed at the end of 2022. It has been made publicly available by EASA. This was the "surveillance" part, which is SERA.6005(c) compliant.

Issue 2 of the protocol has now been submitted to EASA for review. This version largely completes the development of the protocol for the SRD860 transmission path. Publication is expected to take place in the next few months. Further development of the protocol only makes sense once a certain level of acceptance and adaptation to the protocol has been achieved on the market.

In practice, no transmitter with ADS-L is yet in operation in the SRD860 band, although the first new devices with ADS-L and the ADS-L update for FLARM devices are already available (see previous chapter).

From a technical point of view, transmission in the O-band including an HDR (high data rate) channel is now integrated. Up to 10 individual aircraft positions can now be transmitted in one traffic report. Furthermore, error correction and a security procedure have now been integrated into the protocol. Whether this is sufficient remains to be seen in practice. The transmission of FIS-B services analogous to UAT technology has also been included, as has the transmission of Remote ID. By including Remote ID in the ADS-L protocol, the very short range of Remote ID can be significantly improved.

3.5. Implementation issues

To support the i-conspicuity concept and the ADS-L protocol EASA and Eurocontrol agreed on the following points:

It is understood that there are several systems for e-conspicuity on the market, but the diversity of technological solutions has resulted in a lack of interoperability in terms of communication protocol (language) and means of communication (link). Therefore, the main objectives are the reduction of mid-air collisions by enhancing the pilot's situational awareness to assist in avoidance of collision and/or mitigation of other airborne hazards. It is also understood that the solutions will not serve as collision avoidance systems, nor as surveillance tools in support of ATC. The chosen solution shall also serve as means making manned aviation conspicuous if flying in the U-Space airspace and not being under Air Traffic Control service. It is also very important to respect the different needs of the different user groups in general aviation for the successful introduction of interoperable solutions.

In EASA/ Eurocontrol opinion the solution should be independent of any ground networks for the pilot awareness use case. Therefore, a direct link is necessary. However, the extended full functionality that was considered in the case studies (D3.1 and D3.2) and in the workshops is only possible with the support from networks. The use of solutions in the mobile sector is impossible without a network.

Outside of U-space airspace equipage with e-conspicuity is voluntary and the usage must not trigger any investigations based solely on conspicuity. As the enabling technologies the transmission paths ADS-B 1090MHz, ADS-B UAT (978MHz), SRD 860 and Mobile Telecom are designated (with the aforementioned restrictions for UAT frequency use). Contrary to the original expectation of a rapid development and expansion of U-Spaces, it is now assumed that there will initially only be isolated U-space airspaces in highly frequented airspaces where the induced higher air risk needs to be mitigated.

As a further objective subject to further research a complement to the Flight Information Service (FIS) and Search and Rescue without requiring changes to existing ATM/ ANS principles and/ or operational practices is identified. These areas were shown in Deliverable 3.2 (additional case studies).

As a further step towards a better air situation picture, the German air traffic control (DFS) has now received two funding programs to drive the expansion of the ADS-B system for lower airspace as well.

4. Updated action plan

The action plan presented in Deliverable 3.1 outlined recommendations for EASA, encompassing general actions from workshops and surveys, as well as those from analysing the different transmission paths. Key steps include establishing a clear communication on e-conspicuity's merits and limitations and incorporating user feedback into the solution structuring. This step already started very successfully on the AERO 2024 trade in Friedrichshafen. Communication with users and manufacturers was established, the topic of e-conspicuity was explained in detail in presentations and panel discussions and discussed publicly with various experts. Questions from users and spectators were addressed time and again. This communication should be continued through publications in the media, instructional videos, webinars and lectures in clubs and associations to achieve an understanding of the technology and its necessity among users.

Urgent tasks include the finalisation of ADS-L specifications for fast manufacturer implementation and defining network infrastructure requirements. It is particularly important to start with the ADS-L4Mobile specification as this has still not been started even after the publication of Issue 2 for ADS-L4SRD860. Studies on mobile network usage and 1090MHz band load are proposed, along with encouraging NAAs to endorse e-conspicuity solutions and ensuring pilot protection. Human-machine interface optimisation, training, and financial considerations, including support programs for hardware upgrades, are emphasised for widespread acceptance.

The possibility of using UAT for conspicuity in U-Space was also included in SERA 6005c, with the restriction that use is only permitted after coordination with all participating states. Therefore, the availability must be proven in more detail, as the usage of UAT might be very useful in drone and General Aviation use cases. Some countries in Europe (e.g. Norway and Finland) have already setup test environments or even larger test areas for UAT. The main problem for the widespread use of UAT in Europe is the frequency availability, here especially the frequencies 978MHz and 979MHz, as there are a very little number of military TACAN systems still working on this frequency. Freeing up the needed frequencies should be enforced even if the timescale for this is estimated about 5 years in best case and the change of frequency for TACAN systems mean some investment. The UAT spectrum was planned in 2002 in connection with the development of the DO-282. The result was that only co-channel (978 MHz) and adjacent-channel (979 MHz) DME/TACAN stations need to be considered. The selectivity of the UAT receiver and the pulse interference performance ensure that all other DME/TACAN channels have no influence on the UAT performance.

In this context, the strategy for the desired solutions must be defined more clearly. In Deliverable 3.1, the three main transmission paths were examined in case studies. To achieve the full potential for the end devices, the combination of transmission paths is important. However, this requires a network with appropriate storage structures, especially for the connection of mobile radio and for the transmission of information from the ground to the aircraft. The storage structures are also necessary above all for the additional benefits of SAR, incident analysis and training (see Deliverable 3.2). In some discussions with EASA, however, the direction was taken to initially enable air-to-air communication only. However, this would prevent decisive (purchasing) arguments (additional benefits through weather, airport, and airspace data, for example).

Still, the additional benefits beyond traffic information need to be defined more precisely and made clear to potential users. This is a very important argument to encourage the user to install new hardware or upgrade existing hardware.

In addition, further research must be launched to establish the necessary networks to create the needed ground structures. Test scenarios should also be created at suitable airfields to test the interaction of the technologies, the network, and the mobile network. This can also be used to hold constructive discussions with mobile phone providers based on measurement series.

EASA attracted attention at the AERO trade fair with its ADS-L coalition and iConspicuity declaration. The ADS-L coalition is intended to persuade manufacturers to integrate the ADS-L protocol, which is largely working (see AERO's influence). The iConspicuity declaration is intended to ensure that an aviation participant will not be penalised by the NAAs simply because it is conspicuous.

5. Issues not resolved and remaining risks for implementation

Many areas are still open in the development of solutions and there are unresolved challenges and risks. In contrast to the specification of ADS-L4SRD860, which is already in its second version, the specification of ADS-L4Mobile has neither been started nor has a consortium or team been appointed to create it. This should now be done quickly, as the area of mobile radio is essential in the overall system.

Most users are aware of the importance of interoperable e-conspicuity systems, or can easily be made aware of them, but ADS-L is not a protocol that everyone has been waiting for, it comes some years too late. Many users have already committed themselves to one e-conspicuity device and the will to extend or change this to ADS-L must be generated with convincing benefits. Potential users must be offered additional information and benefits such as the usability of controlled airspaces outside of U-Spaces. Otherwise, there is a risk of failure due to a lack of acceptance. The ADS-L protocol cannot just be a replacement for existing solutions. It must offer concrete added value, and the usability of U-Space using the ADS-L protocol is not enough. Manufacturers will only develop and launch new devices and upgrades when there are defined specifications and standards.

In terms of UAT some organizations (IAOPA) and individual countries are setting it up test scenarios and test areas for UAT within Europe as they consider the UAT solution to be more feasible for i-conspicuity than the integration of ADS-L. The Europe-wide usage of UAT is not approved yet due to frequency assignments of (military) TACAN systems. There is a consensus that it is technically possible to use UAT in Europe. This has already been described in RTCA DO-282C. As both technologies (UAT and ADS-L) are approved for conspicuity in U-Space and UAT is already in use, the parallel development of ADS-L and UAT leads to confusion among potential users and makes it more difficult for ADS-L, for example, to be rolled out across the board. Countries like UK (not an EASA member state) will not support ADS-L, but UAT, even when a major technical part of the ADS-L transmission technology is setup by PilotAware, which is mostly used in the UK. It would therefore be advisable to keep an open mind about UAT technology and investigate its feasibility in Europe in more detail.

The plans to integrate ADS-L are currently limited to Europe. For large-scale acceptance, it is also essential that a system used in Europe can also be used outside of Europe. As this is a study for the EASA member states, it is necessary to take an even smaller-scale approach here (example: UK). For example, the FAA is called upon to work with manufacturers, pilots, industry groups, etc. to find a low-cost voluntary solution for conspicuity. This could also be ADS-L. If it is introduced throughout Europe, the possibility of usage outside of Europe would also have to be ensured.

Until now, research and strategies regarding i-conspicuity stopped at the integration of the required networks. An intelligent i-conspicuity network with users on all the transmission channels under consideration (and more will be added in the future, such as satellite connections) requires a network structure to be able to compile, verify, filter, and transmit the information. Furthermore, network information, such as that coming from OGN and Safesky networks, must be integrated. Finally, the costs (and cost units) can only be determined once the necessary network structure has been clearly defined.

A further important point is the initiation of funding programs that support new hardware and software purchases and upgrades for clubs and individual pilots. No targeted activities have yet been launched in this area. This also applies to the creation of corresponding traffic networks.

Another unsolved issue is the availability and usability of FLARM SRD frequencies within the next 10 years. The ITU (International Telecommunication Union) has published statements from the WRC (World Radiocommunication Conference) 2023 that indicate plans to use the neighbouring frequencies of FLARM by mobile radio. In such a case, this could be a "blocking" in the receivers. However, this problem was recognised and solved by the (original) FLARM manufacturer years ago and the devices are robust against blocking. Other manufacturers may have to change their device architectures. The next WRC is in 2027 and even if the use of the aforementioned neighbouring frequencies by FLARM were to be decided then, this decision still must be made by the ETSI (European Telecommunications Standards Institute) and the Member States. The time horizon here is certainly beyond the 10-year limit. Nevertheless, the technical and legal aspects should be clearly clarified here, as FLARM technology is one of the pillars of ADS-L.

6. Overall conclusion

The developments pointed out here as examples show that the way to combine the transmission paths (1090MHz, SRD860 and mobile radio, and others) together in the e-conspicuity devices as multilink is the right one. The investigations in the workshops, technical meetings and case studies were fundamentally correct.

The main issue that emerged for the development of an i-conspicuity environment in Europe was the lack of information on the subject and its limitations. At the AERO trade fair, presentations and panel discussions were held with experts and manufacturers, which were well attended and clearly confirmed the lack of information.

Specification 2 of the ADS-L4SRD860 protocol has been submitted for review and contains further developments to the pure surveillance part. The counterpart, ADS-L4Mobile, has still not started and must be tackled quickly.

ADS-L will be more and more integrated into new and existing devices as shown on the AERO fare. Integration into existing systems has been successfully demonstrated and the acquisition of corresponding software upgrades has started.

Test operations and research in the field of professional aviation, such as the ADAC rescue service, will provide helpful results for usage in commercial and non-commercial aircraft.

In the area of UAT, various organisations and country-specific activities have taken place to introduce UAT for test purposes or across the board. Even if the topic was only given secondary consideration in the project, the possibilities should be closely monitored, especially since the use of the UAT frequency in Europe has not been conclusively clarified.

The action plan created in Deliverable 3.1 was reviewed, revised, and expanded. Furthermore, the outstanding, unresolved points and risks were reassessed.