



## **ANDS Committee Report**

IGC Plenary, February 26, 2016

Dear Delegates,

*I cannot begin my first report as Chairman of this committee without acknowledging my inimitable predecessor, Bernald Smith. Twenty-three years ago, Bernald was the first to recognize the enormous implications of the simple idea of replacing cameras with flight recorders. Under his leadership, the original “GNSS Committee” researched existing standards and technologies and paved the way for the creation of all the new standards that we enjoy today. His vision contributed directly to the creation of new record categories, new Tasks, and new types of competitions, enhancing our sport beyond measure. I am happy to report that Bernald has agreed to remain a member of ANDS, as Chairman Emeritus.*

### **NEWS**

You will be familiar by now with the difficulty of preparing reports on the year-end meetings of ICG, RTCA, and the most recent news from EASA and FAA - in advance of the IGC agenda deadline. Bernald has always done an admirable job of adding these reports at the last minute, and it is hoped that he will continue to keep us informed this year. In anticipation of a more complete report from Bernald, the following news items are presented:

- The eleventh and twelfth satellites of Europe’s Galileo GNSS were launched successfully in December. The system is on schedule to be operational (with 16 satellites) by the end of 2016.
- At the December meeting of the International Commission on GNSS (ICG), emphasis was placed on interoperability of the five GNS systems currently operational or planned.
- FAA began registering “small” Unmanned Aerial Systems in December and received 45000 applications in the first two days. The US Academy of Model Aeronautics urged its 140000 members not to register their RC models, at least for the time being.
- EASA has issued a blanket Minor Change Approval to FLARM Technology AG, for the installation of PowerFLARM in gliders and airplanes. FLARM has offered these approvals for sale to the owners of individual aircraft.

## GFAC

A separate report from GFAC is on the agenda. The Committee continues to run smoothly and independently of ANDS under the outstanding leadership of Chairman Ian Strachan (UK). The term of committee member Marc Ramsey (USA) expires this year, and Marc has agreed to stand for another three-year term. Additionally, the GFAC Chairman has nominated Peter Purdie (UK) to become the sixth member of GFAC. ANDS supports these changes and recommends their approval by the Plenum.

## FLARM

The subject of an open radio protocol for collision-avoidance systems has been on the table since 2008. Recently, a petition calling for an open protocol has been circulated. It is reasonable to expect IGC to take a position on this topic, and ANDS has made the recommendations in the annex attached to this report.

More globally, the use of FLARM in Category 1 competitions has been debated ever since the rule requiring collision avoidance equipment became effective in 2014.

These questions are paramount:

1. Should we continue to require installation of collision avoidance transceivers in our competitions? If yes, how do we enforce that they be used?
2. Should we discourage the use of FLARM for tactical purposes? If so, how?

These questions are both technical and philosophical. The latter is outside the scope of the ANDS charter! ANDS invites all Delegates to contribute their opinions when we are together in Luxembourg.

I would like to thank my fellow ANDS Committee members Bruno Ramseyer, Angel Casado, Ian Strachan, and Bernald Smith for their expertise, and I will continue to depend on their advice in 2016.

Rick Sheppe  
Post Mills, USA

## **Collision Avoidance Protocols**

### **1. Summary**

To be successful, a distributed collision avoidance system depends upon absolute compatibility amongst participants. At a low level, the data communications protocol must be agreed upon.

The widely used FLARM<sup>1</sup> collision avoidance system uses a proprietary message protocol for data communications. The less widely used DSX<sup>2</sup> system currently uses a different protocol and is thus not interoperable with FLARM.

A DSX user has appealed to FLARM to publish a description of the FLARM message protocol and has asked FAI to support an open protocol for collision avoidance transceivers.

This annex to the ANDS report summarizes the situation for the Plenum and makes recommendations.

### **2. Background**

#### **2.1 History**

FLARM has been making collision avoidance transceivers since 2004. The company has licensed the use of collision avoidance modules (hardware and firmware) to the manufacturers of glide computers, flight recorders, and variometers. Between 2005 and 2015, FLARM Technology AG has issued five firmware upgrades to their products, which have included changes to the data communications protocol.

DSX has been in the collision avoidance and tracking business since 2006. In the past, DSX (and others) have been able to interpret radio transmissions using the FLARM protocol and have thus been able to benefit from the system designed by FLARM. A potential benefit from this capability is interoperability, i.e. the integration of other vendors' collision avoidance products into a single cooperative network.

In 2007 FLARM and DSX entered into negotiations about operational compatibility. In early 2008, the negotiations ended without any agreements.

Later in 2008, the Italian Federation, FIVV, presented a proposal to IGC in which it asked:

for a declaration of interest by the FAI Gliding Commission about the creation of a common, stable standard in data communications over radio frequencies.

The proposal was adopted, i.e. IGC did declare an interest in the subject. The sense of the Delegates was that the subject should be taken up by consulting experts from outside the Plenum.

In March 2015 FLARM released a firmware upgrade that included a change to their proprietary data communications protocol.

Two months later, a self-identified DSX user named Sergio Elia<sup>3</sup> published an open letter to one of the FLARM principals, asking him to make public a specification of the new protocol, with the goal of interoperability among the manufacturers of collision avoidance systems. The open letter, published in the form of a petition, received a reply from FLARM, and three rebuttals from Mr. Elia. The petition, with the reply, the rebuttals, and comments from the public, is available online<sup>4</sup>. The petition has also been discussed by 29 authors on the usenet group *rec.aviation.soaring*<sup>5</sup>.

In August 2015, FLARM updated a position paper, *System Design and Compatibility*<sup>6</sup>, which presents FLARM's positions on the issues raised in the petition.

## **2.2 Existing requirements for collision avoidance systems**

The only place in Section 3 of the Sporting Code where collision avoidance equipment is mentioned is para. SC3A 4.1.2b(i), which states that in order to be accepted into an international competition a glider must carry "an industry standard collision avoidance transceiver."

Outside of the Sporting Code, some clubs, contest organisers and NACs have established rules regarding the installation and use of collision avoidance equipment.

## **3. Discussion**

### **3.1 The position of FLARM**

In their position paper, FLARM Technology AG, make the following points, among others:

- a) FLARM have addressed the question of interoperability among manufacturers by offering licenses to the manufacturers of gliding instruments.
- b) There is more to compatibility than an agreed message level protocol. The higher level algorithms must also be compatible.
- c) Message level encryption is necessary for product update, privacy, and security reasons.

### **3.2 The position of Mr. Elia**

In the petition, in the usenet group, and elsewhere, Mr. Elia and his supporters make the following points, among others:

- a) The existence of two or more incompatible systems does not promote overall flight safety.
- b) The FLARM licensing arrangement is suitable for manufacturers of glide computers, etc., but is unsuitable for competitors in the collision avoidance business.
- c) Encryption of the data communications protocol is unnecessary and is anticompetitive.
- d) Insistence on a single set of high-level algorithms is unnecessary.
- e) In general, open standards have proved to be better at stimulating the marketplace than proprietary technology. Regulatory authorities, including FAI, should create open standards and should not favor one commercial interest over another.

### **3.3 The role of ANDS**

The IGC Airspace, Navigation and Display Systems Committee (ANDS) have assumed the role of providing the advice and recommendations requested by the Plenum during the discussion of the 2008 proposal from Italy.

ANDS is a committee of technical experts, supported by advisors. The Committee has no commercial interests or expertise. All of the findings and opinions below are based solely on the Committee's assessment of the technical situation.

## **4. Findings and opinions**

### **4.1 FAI as a neutral party**

This Committee agrees with Mr. Elia that FAI should remain neutral and not favor one commercial interest over another.

### **4.2 The promotion of a standard**

We agree with Mr. Elia that interoperability is desirable both for safety and for market reasons, and we agree that an open data communication protocol would allow at least a minimum level of interoperability. We disagree with FLARM that interoperability absolutely depends on the standardization of higher level algorithms (but see §4.5, below).

If the decision were taken to specify an open data communication protocol, the responsibility for its creation would be assumed by a neutral third-party standards organisation. If, as Mr. Elia suggests, FAI were to serve this role, it would create a situation similar to that of GNSS Flight Recorders, with one critical difference. The FLARM protocol has been well established in the user community before the proposed creation of any public domain specification. It would be unthinkable to create a specification with which FLARM does not already comply.

Furthermore, the time it would take for any standards organisation to develop an open protocol with which FLARM would be compatible must be considered. It could

easily take us to the day when low-cost ADS-B solutions might exist as an alternative.

We must face the fact that FAI will not independently develop an open data communications protocol, and that Mr. Elia's request for an open protocol is tantamount to a request for the FLARM protocol.

#### **4.3 The applicability of the FLARM licensing agreement to a competitor**

Mr. Elia claims that the FLARM licensing arrangement, while suitable for some instrument manufacturers, is not applicable to a direct competitor. This Committee has no means to judge whether the FLARM licensing arrangement could be used by a direct competitor, so we have no way to evaluate Mr. Elia's claim.

#### **4.4 The alleged advantages of message level encryption**

We agree with only one of FLARM's cited benefits of message level encryption: the protection of privacy.

An open data communication protocol can contribute to a loss of privacy. It is reasonable for a pilot to be willing to give up identity and location information for the purpose of participating in a cooperative network, and at the same time be unwilling to have this information available to the general public.

However, it must be noted that the privacy argument is almost certainly lost already. Websites that display the real time position of IFR traffic are common, and they will become more common as ADS-B is deployed. There is universal interest in our community in glider tracking, and the reception and processing of anti-collision transmissions is one way to do this. IGC support the efforts of the Open Glider Network Project (OGN)<sup>7</sup> and the companies that provide tracking hardware and application software.

The truth is that the only way to guarantee privacy is to turn the transmitter off. Basing the argument for encryption on privacy concerns is incongruous in today's world.

We agree that control of the protocol facilitates enforcement of product upgrades. However, there are other ways of doing this, and we disagree with FLARM that the product upgrade schedule depends on having control of the protocol.

#### **4.5 The challenge of interoperability**

The position of FLARM is that interoperability is achievable either by central control of the hardware and firmware, or by an open standard<sup>8</sup>, with nothing possible between the two. This is a reasonable position only if interoperability is defined as complete functional compatibility.

In their arguments, Mr. Elia and his supporters seem to believe that interoperability is achievable with an understanding of the FLARM radio protocol. This is a reasonable

position only if interoperability is limited to one-way communications, i.e. only if the non-FLARM equipment were to operate in “receive-only” mode. There is a potential for causing harm to the network by transmitting unexpected data, incorrect data, or by not respecting bandwidth or collision-detection conventions. So far, Mr. Elia and his supporters have not publicly addressed this topic, and the burden of proof that any transmissions by DSX equipment would not degrade the network lies with DSX.

We disagree with FLARM that limited interoperability between manufacturers is infeasible, and we disagree with Mr. Elia and his supporters that an understanding of the radio protocol is sufficient to allow interoperability (beyond “receive-only”) without formal testing.

## **5. Conclusions**

Interoperability is desirable for reasons of enhanced safety and for the good of the competitive marketplace.

It is not practical or desirable at this stage for FAI to develop an open data communications protocol for use by collision avoidance transceivers. It is not true - as some have claimed - that IGC agreed to do this in 2008.

The de facto protocol for the foreseeable future is the FLARM protocol, and the decision to encrypt it is entirely at the discretion of FLARM Technology AG.

Notwithstanding the above, it is our opinion that the justifications for encryption cited by FLARM are weak, and that the actual motivations for encrypting the messages fall largely outside the technical realm.

The burden of proof that another manufacturer’s collision avoidance transceiver will not cause harm to the FLARM network lies with the other manufacturer.

## **6. Recommendation to the Plenum**

The ANDS Committee recommend that the Plenum support adding the topic of “Interoperability” to the agenda in the ongoing discussions between IGC and FLARM Technology AG about future FLARM functionality.

We recommend that IGC encourage FLARM and any other manufacturer of collision avoidance equipment to seek licensing agreements that serve the needs of both parties.

We further recommend changing the wording of SC3A 4.1.2b(i) to make it clear that alternatives to FLARM are acceptable.

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<sup>1</sup> FLARM Technology AG

<http://www.flarm.com>

<sup>2</sup> DSX High Tech Sagl

<https://www.linkedin.com/company/dsx-high-tech-sagl>

<sup>3</sup> Sergio Elia, DSX user

<https://groups.google.com/forum/#!msg/rec.aviation.soaring/CXdhpXIaiu0/PhXk2J0kwD8J>

<sup>4</sup> Petition

<https://www.change.org/p/mr-urs-rothacher-flarm-chairman-petition-against-flarm-decision-to-encrypt-the-communication-protocol#petition-letter>

<sup>5</sup> Usenet discussion

[https://groups.google.com/forum/#!searchin/rec.aviation.soaring/help\\$20us\\$20with\\$20this\\$20petition/rec.aviation.soaring/CXdhpXIaiu0/overview](https://groups.google.com/forum/#!searchin/rec.aviation.soaring/help$20us$20with$20this$20petition/rec.aviation.soaring/CXdhpXIaiu0/overview)

<sup>6</sup> FLARM paper on compatibility

<http://flarm.com/wp-content/uploads/2015/08/FLARM-System-Design-and-Compatibility.pdf>

<sup>7</sup> Open Glider Network Project

<http://wiki.glidernet.org/>

<sup>8</sup> The terms used by FLARM are “compatibility by design” and “compatibility by standards and certification,” respectively.