Subject: Report of the Logbook of the World (LoTW) Study Committee
To: ARRL Board of Directors
Date: January 2014

In January 2013, the Board of Directors approved forming a LoTW Study Committee (LSC). So began our year-long journey through the many aspects of both software and amateur radio that relate to keeping track of who contacts whom in all its forms. LoTW is in a much better situation today than it was before, but there is much still to be done. This report will discuss what we (the LSC) have found, what has been done, what is in progress, and what is still left to do.

Executive Summary

Logbook of the World is a victim of its own success. In late 2012, it became overloaded and ground to a halt. It was rescued by judicious purchases of fast storage and application of well-informed and executed IT processes. An important part of the LoTW Study Committee's charter was to ensure that we could remain "ahead of the curve" to continue the high acceptance LoTW has enjoyed.

There have been two types of efforts in 2013 on Logbook. A small but highly dedicated and capable group of volunteer open-source developers re-structured the TQSL-LoTW interface to improve TQSL's reliability and usability, and eliminate complexity in the use of Logbook.

A Technical Advisory Committee has been formed which will work on new releases and other restructuring. The group also recommended several areas of investment to reduce Logbook's "technical debt," and these were approved by the ARRL Board at its July 2013 meeting.

The LoTW Study Committee provided the second type of effort by considering other methods which could reduce technical debt. Most of these focus on "digging out" of the technical hole in which Logbook exists today, and avoiding digging in further before we get out of the hole. A key component of this is communication. Users need information on how thing work, and how they are working. They need to know how to do things, as well as what has happened to their data in Logbook. Work is in progress to help provide both sorts of information, and new information has already been made available. The Logbook user community has already taken appreciative note of these improvements along with the technical improvements already mentioned.

The LSC was formed without a specific sunset date. When we reported to A&F in November, our intent was to report to the Board in January 2014 and dissolve. A&F asked the LSC to continue its work into 2014, recognizing the progress that has been made, and the need to continue efforts already in process. LSC agreed to continue, so this report represents an update on its continuing efforts.

Logbook Study Committee (LSC)
The LSC met monthly during 2013, by webinar and face to face at the quarterly A&F Committee meetings and July Board meeting. These meetings enabled us to develop several areas of inquiry which progressed independently between meetings. The three areas were:

- Technical position and needs (hardware and software, user processes)
- Costs and revenues
- Value and communication to users

LoTW's Technical Position
In our previous report, we identified the "technical debt" under which LoTW operates, composed of the restrictions or problems from expedient decisions in the past. We now must finally pay that deferred debt. The most significant implication of this situation is that basic technical issues must be addressed before adding new features, etc. As the technical group put it "the first rule of getting out of a hole is to stop digging." The ARRL Board at its July 2013 meeting authorized a new full-time programming hire to work on Logbook, along with consulting funds to deal with some specific database issues. Efforts on these goals are underway. We will make significant progress at getting the "hole" filled in 2014—if no other requirements are imposed that require further digging the hole.

The depth of our technical debt was a key realization from our discussions in 2013. A second is that Logbook's rules for awards, QSO matches, etc., are documented only in the Logbook code. That is, there is no source other than Logbook's program which users, programmers and helpline people can use to understand and verify correct processing of awards. From a technical standpoint, this means programmers have no guidance other than earlier code, and software testers have no standard against which to judge program performance. For users, this means they have no document that describes how their logs will be processed. Thus, the lack of documentation is an issue for both Logbook's technical staff and its user community. Work has started to create document(s) to fill this gap, but this problem was only recently understood, so there hasn't been much time yet to make progress. However, creating this documentation is clearly a "hole-filling" activity.

For those familiar with software testing for release, we mention briefly that the lack of documentation also implies that good regression testing is impossible, and that there is certainly no automated regression testing available. As long as this continues, each new release puts Logbook at increasing risk. Creating automated regression testing is one of the 2014 goals in ARRL IT.

As a complement to software improvement, IT is also creating a second hardware instance of the LoTW environment, so that testing (including load testing) can be performed off-line. This will also provide some backup capability in case of failure of LoTW's primary servers.

LoTW's Cost and Revenues
Like many activities at ARRL headquarters, Logbook receives intense attention from a handful of people, but is touched by many more, for a variety of different purposes. This complicates computing an exact cost. However, the group has made some progress in understanding the cost structure of Logbook activities.

More will need to be done on this topic, but it is important to note that our real need is to understand the incremental costs of adding new awards and features, and, of course, users. IT currently accounts for around 10 percent of ARRL operating costs, and we need to manage those expenses carefully.

One goal of creating the LSC was to discover ways to monetize Logbook's capabilities. We still believe there are opportunities here. We've also discovered that there are awards granted outside ARRL that essentially use LoTW output screens as their award-processing mechanism, for which no one pays anything. This is a dis-service to ARRL members, and we need to develop some innovative ways to address it. The LSC clearly recognizes, however, the desirability of DXpeditions and similar stations being able and willing to upload their logbooks quickly and for free. Ensuring that this can continue is the first consideration for any changes in Logbook operation.

It should be noted that many of the expanded uses of LoTW were already identified 10 years ago, but only recently have they become viable as LoTW matures. Their successful implementation will depend on first "getting out of the hole."

LoTW's Value and Communication to Users
It is ironic that most of the difficulties in amateur radio include (lack of) communication at their heart. The LoTW "ecosphere" includes a wide variety of communities—developers of logging software, award seekers and grantors, and operators from the DX, VHF, EME, digital, legacy and other communities. Of course, the use of Logbook differs slightly from one community to the next, which means no aspect of Logbook is uncritical. There is little available documentation on how each of these communities can successfully use Logbook, which is an unfortunate barrier for many would-be users. During the closing months of 2012, when Logbook was having trouble, it became clear how much communication could improve or worsen the situation.

So, improvements in several kinds of communication are needed—

- Step-by-step task-oriented documentation;
- Reference documentation on how LoTW works;
- Realtime status messages to users; and
- Troubleshooting and other similar documentation.

The first draft of a communication plan has been created, and this will be refined. We recognize that LoTW is not particularly friendly about keeping users informed about any issues of Logbook availability and revisions in process. Users also do not receive timely

information about the processing of their logs until they are completed, and this has exacerbated LoTW instability when problems began to emerge, as experienced a year ago. We also believe that the current flow of communications needs to be revised to ensure notification to users when issues are encountered. LSC has begun the process to define methods to ensure communication occurs, and in a timely way. In the past, the existence of problems was not communicated to users until those problems were solved. Our goal is to immediately inform users when there are problems, and keep them reasonably abreast of the status of corrective efforts.

It is important to realize that LoTW is not a logbook—it is a contact verification system, with all the additional complexity that results from needing to match contacts between two stations with absolute integrity and accuracy. It must support the high standards of one of ARRL's most precious assets—DXCC—arguably the most respected award in amateur radio.

This description begins to explain why LoTW apparently employs more security than does your credit card company. If your credit card is stolen, the company can invalidate it and issue a new one, writing off any loss. If an LoTW security breach allowed the insertion of confirmed QSOs, the integrity of the DXCC award program would be damaged irreparably. This does not excuse inconvenience and poor usability—which the Trusted QSL team has been working to improve—but it is the rationale for erring on the side of being more rather than less secure.

LoTW Stability and Usability

For the everyday use of LoTW, the client program TQSL along with LoTW's web interface provide the major user interface. The technical group working on Logbook recognized that TQSL and TQSLCert had severe usability and robustness problems. Since these applications were built from an open source code base, it was possible to recruit a group of developers to immediately begin working to mitigate these problems. Several improvements in usability were realized by hiding the complexity of certificates, etc., within the TQSL program, and not requiring any user involvement at all. TQSL has also become the vehicle for keeping track of what QSOs a user has already uploaded from a computer, and preventing re-uploading of those QSOs, thereby sparing the LoTW Server from having to perform unnecessary processing.

Thanks to the technical volunteers who are making LoTW Server and TQSL upgrades possible:

Trusted QSL Developers -- LotW Client (TQSL) development

Dave Bernstein, AA6YQ
Robert Mead, KC2YWE
Rick Murphy, K1MU

LoTW Technical Advisory Committee—LoTW Server issues

Dave Bernstein, AA6YQ
Rick Murphy, K1MU
Dave Pascoe, KM3T
Michael Wells, G7VJR
Kenneth Wolff, K1EA

The Technical Advisory Committee supports and advises Michael Keane K1MK, who is head of ARRL IT.

Further re-architecting of the data structure will be undertaken in 2014. Together with performance improvements achieved in 2013, appropriate data structures will help ensure the stability of the application.

LoTW in 2014

The 2014-2015 ARRL plan includes continuation of support to LoTW from the Board's July 2013 resolution. The LSC firmly again supports that this investment is crucial to "getting out of the hole."

In addition, A&F has asked the LSC to continue its work into 2014, recognizing the progress that has been made, and the need to continue efforts already in process. The LSC and Technical Advisory Committee appreciate this recognition of their work, and have definite visions of the work to be accomplished in 2014.

Respectfully submitted—

This report was produced by the LSC, "LoTW Study Committee". Members are:

Dave Bernstein, AA6YQ
Michael Keane, K1MK
Rick Niswander, K7GM
Dave Patton, NN1N
Barry Shelley, N1VXY
Greg Widin, K0GW, Chair