COPPERCHASE ATIS
(AUTOMATIC TERMINAL INFORMATION SERVICE) SYSTEM

TECHNICAL DESCRIPTION
## CONTENTS

1 Introduction ................................. 5

1.1 Glossary ................................ 5
1.2 Overview ................................ 5
1.3 Features ................................ 7
1.4 Options ................................ 8

2 Design ...................................... 9

2.1 Reference Documents .................... 9
2.2 Performance .............................. 9
2.3 Scheme of Operation ..................... 9
   2.3.1 Message Generation .................. 10
   2.3.2 Text-to-Speech Conversion ......... 10
   2.3.3 Message Transmission ............... 11
   2.3.4 Watchdog Functions ................ 12

3 Physical Connection Options (Interfaces) . 15

3.1 Interfaces to Other Airport Systems (Optional) .... 15
3.2 Connection to Radio Transmitters ............ 15
3.3 PSTN Connection (Optional) ............... 15
3.4 Datalink Interface (Optional) .............. 15

4 System Architecture ........................ 17

4.1 Overview ................................ 17
4.2 ATIS Hardware ........................... 17
   4.2.1 Overview ................................ 17
   4.2.2 ATIS Preparation PC .................. 18
   4.2.3 Headset and Microphone .............. 18
   4.2.4 Transmitter Keying and Impedance Matching Unit 18
   4.2.5 ATIS Transmission PC ................. 19

4.3 High Availability Architecture .......... 19
   4.3.1 Possible Configurations .............. 19
   4.3.2 Dual-Redundant ATIS Preparation PC Configuration 20
   4.3.3 High Availability ATIS Transmitter PC Configuration 20
   4.3.4 Resilient PSTN Connection .......... 21

4.4 Software ................................ 22
   4.4.1 Overview ................................ 22
   4.4.2 The WEDIT32 Application ............. 23
   4.4.3 The ATISPREP Application .............. 25
   4.4.4 The ATISTX Application ............... 27
   4.4.5 The ATISPSTN Application .............. 28
   4.4.6 ATIS Transmission History Component .... 29
   4.4.7 The ATIS Database .................... 29

4.5 ATIS Options ............................ 32
   4.5.1 PSTN Access .......................... 32
   4.5.2 Separate Arrival and Departure ATIS Broadcasts .... 32
   4.5.3 Datalink ATIS (D-ATIS) ............... 33

5 System Management and Control .............. 36
5.1 OVERVIEW
5.2 MANUAL/AUTOMATIC OPERATION
5.3 TEMPLATE EDITING
5.4 PHRASE EDITING
5.5 EDITING LOGIN DETAILS
5.6 OOS AND IOS MESSAGE RECORDING
5.7 CONVERTED MESSAGE CORRECTION
5.8 DIRECT BROADCAST
5.9 SYSTEM LOG
5.10 BROADCAST MESSAGE ARCHIVE
5.11 DATABASE COMPACTION AND REPAIR
5.12 RECONFIGURATION
5.12.1 SETTINGS FOR ATISPREP APPLICATION
5.12.2 SETTINGS FOR ATISTX APPLICATION
5.12.3 SETTINGS FOR ATISPSTN APPLICATION

6 STANDARD PHRASES

7 AVAILABILITY AND RELIABILITY CALCULATIONS

7.1 HIGH-AVAILABILITY ATIS MTBF CALCULATIONS
1 INTRODUCTION

1.1 GLOSSARY

ACARS  Aircraft Communications, Addressing and Reporting System
AEEC  Airlines Electronic Engineering Committee
AFTN  Aeronautical Fixed Telecommunications Network
ATC  Air Traffic Control
ATFM  Air Traffic Flow Management
ATIS  Automatic Terminal Information Service
ATS  Air Traffic Services
AWOS  Automatic Weather Observation Station
CAVOK  Clear Air and Visibility OK
CCITT  Consultative Committee on International Telegraph and Telephone
CMOS  Complementary Metal Oxide Semiconductor
CPI  characters per inch
CPS  characters per second
DSP  Datalink Service Processor (Provider)
DTR  Data Terminal Ready
EATCHIP  European Air Traffic Control Harmonisation and Integration Programme
FAA  Federal Aviation Authority
GUI  Graphical User Interface
HDD  High Density Disk
HF  High Frequency
ICAO  International Civil Aviation Organisation
IOS  Interruption of Service
METAR  Meteorological Aviation Routine Weather Report
OOS  Out of Service
PABX  Private Automatic Branch Exchange
PSTN  Public Switched Telephone Network
PSU  Power Supply Unit
QFE  Atmospheric Pressure at Aerodrome Elevation
QNH  Atmospheric Pressure at Mean Sea Level
RT  Radio Telephony
RTS  Ready to Send
TCU  Transmission Control Unit
UHF  Ultra High Frequency
VHF  Very High Frequency
WMO  World Meteorological Organisation
XML  Extended Markup Language

1.2 OVERVIEW

This document provides the detailed technical description of the Copperchase ATIS.

The Copperchase ATIS product is part of the Copperchase ATC Data System product range. It is an Air Traffic Control (ATC) data processing system that provides meteorological and aeronautical information according to the recommendations of ICAO document Annex 11, Chapter 4.

ATIS is a fully automatic aeronautical information broadcast system for use at airports for approaching and departing aircraft. Runway serviceability, local airport procedures/services and meteorological information received from external communications networks, or generated locally as text, are converted to digitised speech (in the form of WAV files played through standard PC sound cards) for automatic transmission, with or without operator intervention.

This audio signal is then made available for distribution via a radio transmitter (so that aircrew can tune in to the correct radio frequency to hear the ATIS transmission), via dial-up telephone, or any other audio device.

The outgoing message is broadcast continuously until it is updated by a new one. Messages are (typically) updated every half hour at (say) 20 minutes past and 50 minutes past the hour.
The phraseology of the ATIS messages is in accordance with Volume II of ICAO document Annex 10 and the corresponding FAA specifications.

Messages may be spoken in more than one language if required; however the text version of a message is in English only.

ATIS is supplied with a pre-recorded set of standard phrases to suit most airfield applications and it also allows the operating authority to record its own set of standard and bespoke phrases in one or more operator vocal styles.

ATIS is also provided with a (configurable) voice synthesis facility for converting ATIS text to spoken format directly without using pre-recorded spoken phrases.

The information can also be sent via Datalink to suitably equipped aircraft.

The text version of the ATIS broadcast may also be distributed on the AFTN network, either unaltered or in an abbreviated format (depending on a configuration setting).

The system may be configured to provide either:-
- A combined arrival/departure broadcast
- An arrival broadcast only
- A departure broadcast only
- Separate arrival and departure broadcasts.

The Copperchase ATIS provides interfaces to:
- a microphone for the input of broadcast messages and maintenance of a Text/Voice Dictionary;
- a VHF,UHF or HF radio transmitter for the transmission of broadcasts on an assigned ATIS frequency;
- audio monitoring equipment for the off-line monitoring of new messages for ATIS broadcast transmission;
* ATS networks (AFTN/SITA) for reception of METARS and the transmission of ATIS broadcast text;
* the Copperchase Weather Editor for the automatic or manual update of the current weather conditions;
* ACARS Communications services (SITA/ARINC) for the digital exchange of ATIS information to suitably equipped aircraft;
* a dial-up telephone extension for access to the latest ATIS broadcast from the PSTN and local airport extensions.

It also provides a GUI to allow the user to control, configure and monitor the operation of the system.

The Copperchase ATIS is available in a number of hardware configurations as follows:

- A standalone PC with no ATS input and without the option to transmit to the PSTN. This is not a recommended configuration, since in such a system, monitoring of prepared messages can only be performed by interrupting the ‘live’ radio broadcast (because there is only one sound card available).

- A more typical configuration in which the message preparation and message broadcast facilities (radio and PSTN, if configured) run on separate PCs so that preparation of new messages can proceed concurrently with the transmission of the current message and ATS connection is provided.

- A range of high-availability systems with manual or automatic switchable inputs and outputs in which the message preparation and message broadcast facilities all run on separate hardware and each hardware set may independently be a dual-redundant configuration (configured in a 19” mini rack or as commercially available PCs). Such configurations may also include the ability to send to either of two radio transmitters to proof against radio transmitter failure, and the ability to duplicate telephone access to prevent a single point of failure.

- In such a fully-redundant system, the switchover from a faulty operational system to its working standby is automatic and instantaneous (within seconds) and is arbitrated by specially-designed Copperchase hardware which contains a GUI which may be used to perform a manual changeover.

The figure below shows a representative configuration in which hardware is not duplicated (and the PSTN option is not installed).

1.3 FEATURES

The key features of the Copperchase ATIS are:

- Integrates with the AFTN for the exchange of aeronautical information
Can receive meteorological information in METAR/SPECI format from Local Automatic Weather Observation Systems (AWOS) or from Automatic Surface Observation Systems (ASOS)

Can interface to the Copperchase METSYS meteorological system to receive data from the range of meteorological sensors given below, over a configurable RS232/RS485 interface.

- Vaisala PA21 barometer system
- Vaisala PA50 barometer system
- Vaisala WAD21M anemometer system
- Vaisala WD50 wind system
- Vaisala CT12 ceilometer
- Vaisala CT25K ceilometer
- Vaisala CL31 ceilometer
- AGI RVR sensor system

Manual, Semi-Automatic (Attended) and Fully Automatic modes of operation.

Can use human speech recordings generating high quality playback and transmission.

Provides an option to use synthesised voice instead of pre-recorded human voices.

Uses standard PC and sound card (multi-media) technology.

Multiple, local vocal recording sets supporting multiple languages.

Automatic optimisation and manual editing of recorded phrases.

Up to two radio transmitters supported via manual selection from the ATIS preparation workstation.

Automatic monitoring of current output by ATISPREP application with a visual indication of which message is currently being broadcast.

Can be configured to process ICAO-compliant or FAA-compliant METARS and phraseology.

Text and audio archive to removable media for audit purposes.

Provides a System Management interface by means of the standard Copperchase application CPCTASK to allow the system components to be monitored and controlled, including starting and stopping applications if necessary.

Makes full use of the standard Copperchase facilities for logging of system errors and other significant events. (The Copperchase system log maintains a separate log file for each day’s operations. Past days’ logs can be viewed, retained under operator control until deleted manually, archived to exchangeable media or configured so that they are purged automatically after a configurable number of days. There is no limit to the number of days which can be retained online, except that of disk space; typical systems allow for much more than the recommended 30 days.)

1.4 OPTIONS

The base ATIS is supplied as a pair of PCs equipped with sound cards, a headset with microphone and two interface units for the headset and radio transmitter. However, this configuration may be extended with the following options:

- ATIS transmission available for access via the Public Switched Telephone Network (PSTN).
- ATIS/MET display for the distribution of MET and ATC procedures information around an airport, e.g. to Briefing Rooms.
- ATIS availability on Datalink (D-ATIS) to ACARS equipped aircraft via ARINC Air Traffic Services (ATS) Server or directly from the Copperchase ATIS equipment (ARINC/AEEC 623 & 622 Chap. 5).
- High availability, dual processor configuration for minimal down time and maximum service.
- Separate arrival and departure ATIS broadcasts, or combined.
- Configurable ability to generate audio output using a TTS (voice synthesis) facility, employing where necessary customised pronunciation of words by the use of phonetic spelling to ensure correct diction, instead of pre-recorded phrases.
- Can interface to standard Copperchase AFTN software to provide the facility to send messages via an AFTN interface using standard protocols RS232, X25 and TCP/IP, or to an AMHS system via the Copperchase AMHSGateway application.
2 DESIGN

2.1 REFERENCE DOCUMENTS

ATIS may be configured to deal with METAR weather data coded according to ICAO standards or for the FAA encoding of METAR.

ATIS is fully compliant with the provisions of the following documents.

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<tr>
<th>Ref.</th>
<th>Description</th>
<th>Issue</th>
<th>Date</th>
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<tbody>
<tr>
<td>1.</td>
<td>Annex 10 Volume II AERONAUTICAL COMMUNICATIONS</td>
<td></td>
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<td>2.</td>
<td>METEOROLOGICAL SERVICE FOR INTERNATIONAL AIR NAVIGATION, Annex 3</td>
<td></td>
<td>01/07/96</td>
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<td>3.</td>
<td>AIR TRAFFIC SERVICES, Annex 11</td>
<td>Amend.39</td>
<td>15/10/96</td>
</tr>
<tr>
<td>4.</td>
<td>EATCHIP Transition Guidelines for Initial Air/Ground Data Communications Services</td>
<td>Edition 2.0</td>
<td>15/10/96</td>
</tr>
<tr>
<td>5.</td>
<td>ARINC 618-2 Air/Ground Character-Oriented Protocol Specification.</td>
<td>2</td>
<td>20/12/96</td>
</tr>
<tr>
<td>6.</td>
<td>ARINC 620-2 Data Link Ground System Standard and Interface Specification</td>
<td></td>
<td>19/12/97</td>
</tr>
<tr>
<td>7.</td>
<td>ARINC 622-3 ATS Data Link Applications Over ACARS Air-Ground Network</td>
<td>3</td>
<td>16/10/98</td>
</tr>
<tr>
<td>8.</td>
<td>ARINC 623-1 Character-Oriented Air Traffic Service (ATS) Applications</td>
<td>1</td>
<td>12/12/97</td>
</tr>
<tr>
<td>9.</td>
<td>Doc. 4444 Rules of the Air</td>
<td></td>
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<tr>
<td>12.</td>
<td>WMO – No. 782 AERODROME REPORTS AND FORECASTS</td>
<td></td>
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</tr>
<tr>
<td>13.</td>
<td>EAD-89 Datalink Application System document for the ATIS Datalink Service</td>
<td></td>
<td>Dec 2000</td>
</tr>
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<td>16.</td>
<td>ICAO Doc 8585 – “Designators for Aircraft Operating agencies, Aeronautical Authorities and Services”.</td>
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<td>17.</td>
<td>ICAO Doc 9377 Appendix 1 – “Manual on Coordination between Air Traffic Services, Aeronautical Information Services and Aeronautical Meteorological Services”.</td>
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<td>18.</td>
<td>ICAO Doc 9426 – “Air traffic Services Planning Manual”.</td>
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<td>19.</td>
<td>ICAO 8400/4 - “ICAO abbreviations and codes”.</td>
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<td>20.</td>
<td>ICAO 8896-AN/893/5 - “Manual of aeronautical meteorological practices”.</td>
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2.2 PERFORMANCE

The Copperchase ATIS is designed for non-stop, 24-hour operation (after allowance is made for necessary periodic maintenance of stand-alone configurations).

2.3 SCHEME OF OPERATION
2.3.1 MESSAGE GENERATION

The message generation process is started when EITHER: -

- the Weather Editor informs ATIS that new current weather is available, either because it is operating in automatic mode or an operator has invoked the editor and generated new weather data, OR
- an operator has invoked the generation of a message directly from the ATIS user interface

When this occurs, the ATIS code letter for the broadcast is automatically incremented (eg from D to E) to indicate that this is a new ATIS message which is to be generated. (The letter resets to A at midnight if configured to do so, and wraps around to A again whenever a message with ATIS code Z has been generated).

In either case, ATIS messages are generated from the current weather database, which holds the current value of various standard parameters which comprise the weather information, and a template which defines the format of the text message to be generated.

ATIS contains a set of message templates for use in constructing messages and different templates can be used for different situations. For example, different templates might be configured for clear weather conditions and for poor visibility situations. One template is designated the current template and it is this template which is used in the generation of a message.

Each message template defines the contents of six message sections.

- **Section 1** is for introductory text such as “This is London Luton Airport Charlie at 15:50”.
- **Section 2** is for runway information such as “Runway in use 27. Departure runway 08”.
- **Section 3** is for any additional information, eg “Grass cutting on verge close to approach runway”.
- **Section 4** is for the weather information.
- **Section 5** is for trend information.
- **Section 6** may be used to add any closing remarks to the message.

Each template also specifies:

- the order in which the sections are to be constructed in the message.
- the languages in which the message is to be spoken (and their order).

The specification of the contents of each section in a message is built up in the template from a number of tokens. Each token may be one of the following:

- **a phrase** – fixed text which is always generated if the element is present in the template.
- **a special phrase** - fixed text which is always generated if the element is present in the template.
- **a punctuation token** – designed to insert punctuation (comma, full stop etc) into the text message and an appropriate pause into the spoken message.
- **a weather token** – a marker which indicates that the value of a specific field from the current weather database should be inserted into the message. The inserted values may contain measurement units as well as numbers and in some cases qualifying phrases (eg GUSTING). However, they do not include descriptive or label text, since the design expects that this should be specified by a separate phrase element.
- **a condition token** – a marker which indicates that a standard or special phrase is to be included in the message only if the value of a specific field in the current weather database tests successfully against a range of values for that field defined by the condition token.

2.3.2 TEXT-TO-SPEECH CONVERSION

Once the textual part of the ATIS message has been generated, it must be converted into a single WAV file for later transmission. This broadcast file is the concatenation of individual pre-recorded (or pre-synthesised) WAV files corresponding to the standard phrases and numeric values which make up the text message.
ATIS maintains directories of these individual WAV files. A standard set of pre-recorded and pre-synthesised phrases is delivered as standard, and the system provides the facility to generate extra phrases either by recording human voice or by using voice synthesis.

If recorded voices are used, the phrases may be recorded in different voices or languages. For synthesised-voice phrases, 3 commercially-available voices (2 female and 1 male) are provided as standard, all of which speak in English. Other synthesised voices can be made available on bespoke request.

When synthesising new phrases, the synthesis is based on a phonetic representation of the text of the phrase. For most phrases, the phonetic representation defaults simply to the text of the phrase. For difficult phrases involving aviation jargon (eg CAVOK) the phonetic representation can be adjusted on a trial-and-error basis to give the required pronunciation for the selected voice. (For example, the phonetic spelling CAV-O-K gives an acceptable synthetic rendition of the phrase.)

When using the synthesised voice option, a facility to vary the speed of the final concatenated message is provided. This facility is not available for messages derived from human-recorded phrases.

The combination of login id and current template identifies which (consistent) set or sets of WAV files will be used for converting the text message. This design is feasible because weather information from METARS consists largely of fixed phraseology. Punctuation elements have representative WAV files.

Whenever a WAV file is used, its time stamp is modified to ‘Now’. This allows the identification of WAV files which are no longer used.

The construction of the broadcast WAV file is a two-stage process. When the text message is being analysed, an SPK text file is constructed containing a list of all the individual WAV pathnames (one per line) which make up the broadcast. This file is then used to generate the broadcast WAV file.

This two-stage process allows the system to notify the operator if any of the speech files required for the message are missing and allows him to record them before authorising the broadcast. This facility is configurable. If it is enabled, the text message is displayed on screen, with phrases for which no speech file exists in the chosen WAV directory (or directories) highlighted.

If the operator chooses to record a missing phrase, ATIS stores the recording in the appropriate WAV directory or directories so that the phrase will be available for future messages.

If the operator authorises a message without correcting such anomalies, the phrase is ignored in the broadcast file.

### 2.3.3 MESSAGE TRANSMISSION

When a message is ready for transmission, it is made available for use by copying the broadcast WAV file to (configurable) shared directories.

A copy of the submitted ATIS message text is added to the AFTN archive along with a ‘Submitted’ journal entry.

Whenever the transmission of a message to air is completed, the shared directory is searched for the latest WAV file to play. If more than one file is found, only the latest message is selected. Any earlier files are deleted and an entry placed in the system log.

The current ATIS message is played repeatedly to air, with a configurable delay between repeats, until a new message is available for broadcast, or a (configurable) “validity period” has expired. If the period expires before a new message is ready, the system (configurably) either:

- plays an out-of-service message;
- stops broadcasting;
- restarts the validity period and continues to broadcast the existing message.

Whenever a new message is initiated, the text and speech files are copied to an archive directory.

Message transmission to the PSTN is handled with the aid of a PSTN interface card from Dialogic.

When the premium number for the ATIS PSTN service is dialled, the incoming call is answered by the Dialogic card which transfers control to ATIS software. A (configurable) shared directory is then searched
for the latest WAV file to play. If more than one file is found, only the latest message is selected. Any earlier files are deleted and an entry placed in the system log.

The current ATIS message is played repeatedly, with a configurable delay between repeats, until either:

- the caller hangs up
- the (configurable) number of repeats has expired.
- the ATIS operator forces the call to terminate by invoking the Force On-hook facility of the user interface. (This facility is provided in case an incoming call fails to hang up properly).

### 2.3.4 WATCHDOG FUNCTIONS

Because a typical ATIS equipment configuration consists of several PCs networked together with ATIS applications running on each and utilising shared disks, each ATIS application has a watchdog facility which can be enabled via its configuration settings.

When the watchdog is enabled, a routine in the application is invoked periodically and writes details of its current activities to a shared XML-format file. The absence of recent information from an application is an indication that the application is malfunctioning or no longer running.

A monitor application can read the watchdog file periodically to warn an operator of any failures. More than one monitor can be available to provide warnings at strategic locations.
3 PHYSICAL CONNECTION OPTIONS (INTERFACES)

3.1 INTERFACES TO OTHER AIRPORT SYSTEMS (OPTIONAL)
The Copperchase ATIS may interface to the AFTN, supporting the functions of a standard ICAO AFTN Message protocol defined in ICAO Annex 10 Volumes 1 and 2. This interface may be used to connect the ATIS the global AFTN or used to interface to an AWOS for the exchange of meteorological information.

Connection Types:
- Asynchronous/RS232
- AFTN over X.25 (PVC/SVC)
- High Level (Telex Type)
- TCP/IP (Sockets)

3.2 CONNECTION TO RADIO TRANSMITTERS
The Radio transmission equipment used for the broadcast of the voice ATIS is not supplied by Copperchase as standard. However, a model that has been used successfully with the Copperchase ATIS is the ParkAir PA5325. Normally a pair of PA5325’s is used with separate antennae to provide a high availability.

3.3 PSTN CONNECTION (OPTIONAL)
Installed as a half-sized digital signal processing (DSP)-based voice processing board, it has two (up to 4) telephone line interface circuits for analog loop start lines.

TELEPHONE INTERFACE:
- Trunk type: Loop start
- Impedance: 600 ohms nominal
- Ring detection: 25 Vrms min., 15.3 Hz to 68 Hz, 150 Vrms max.
- Loop current range: 20 mA to 120 mA, dc (polarity insensitive)
- Crosstalk coupling: -70 dB at 3 kHz channel to channel
- Frequency response: 300 Hz to 3400 Hz ±3 dB (transmit and receive)
- Connector: Two RJ-11 type

AUDIO INTERFACE:
- Line input impedance: 10 Kohms
- Line input signal range: -32 dBv to -2 dBv, AC coupled mono or stereo
- Line input connector: 3.5 mm stereo audio jack
- Line output impedance: 600 ohms
- Line output signal range: -32 dBv to -2 dBv, mono
- Line output connector: 3.5 mm stereo audio jack

REGULATORY CERTIFICATIONS:
- United States: FCC part 68 ID#: EBZUSA-65588-VM-E
- REN: 1.0B
- UL: E143032
- Canada: C CS-03, 885 4452 A
- Load number: 5
- ULC: E143032

3.4 DATALINK INTERFACE (OPTIONAL)
The Datalink service interface of the Copperchase ATIS (D-ATIS) may be either the AFTN for non-622/623 communications. For full 622/623 support, the interface may be X.25 utilising an Eicon X.25 card, or TCP/IP via IBM MQSeries client software.

The X.25 communications is based on the CCITT X.25 1984 recommendations with regard to layers 1, 2 and 3.
4 SYSTEM ARCHITECTURE

4.1 OVERVIEW

Because Copperchase ATIS is built from industry standard components, it can be supported and maintained by Copperchase or a third-party maintenance company for at least 10 years. The various processing units are based on PC technology, using either standard PCs, or PCs mounted in 19-inch racks with additional cooling and more robust power supplies.

The Copperchase ATIS consists of the following components:

- ATIS PC hardware;
- the headset and microphone;
- the radio transmission keying and impedance matching unit;
- the Copperchase Weather Editor WEDIT32 SW application;
- the ATISPREP S/W application responsible for the receipt of aeronautical information and its conversion into digitised speech ready for transmission;
- the ATISTX S/W application responsible for transmitting digitised speech to the radio transmitter interface;
- the (optional) ATISPSTN S/W application responsible for transmitting digitised speech to the dialled-up telephone extension interface;
- the standard Copperchase AFGATE components for connection to the AFTN, journalling, archiving etc.

4.2 ATIS HARDWARE

4.2.1 OVERVIEW

The components of the basic Copperchase ATIS are shown below:

- Headset and Microphone
  Used to check and verify the ATIS Text to Speech conversion prior to its submission for broadcast. Also used for recording and playback of new words and phrases to extend the system lexicon.
ATIS Preparation PC  
An industry standard PC equipped with serial communications, a network card and a sound card. This workstation is the main operator position for the control and generation of ATIS messages. One or more ATIS Preparation Workstations may be configured.

Printer  
A Dot Matrix printer used to print message text and other information.

ATIS Transmission PC  
An industry standard PC, connected via an Ethernet link to the ATIS Preparation Workstation. It is responsible for continuously broadcasting the current ATIS transmission to air via its sound card.

Transmission Keying and Impedance Matching Unit  
Used to control the transmitter selection, A or B and ‘Press-To-Talk’ functions via the PC RS232 serial output control lines. The audio output signal circuitry provides galvanic isolation with level and impedance matching to render an output of 0dbm into a 600-ohm line for an on screen volume setting of 50%.

4.2.2 ATIS PREPARATION PC  
An industry standard PC equipped with serial communications, a network card and a sound card. This workstation is the main operator position for the control and generation of ATIS messages. One or more ATIS Preparation PCs may be configured.

4.2.3 HEADSET AND MICROPHONE  
Used to check and verify the ATIS text to speech conversion prior to submission for broadcast. Also used for recording and playback of new words and phrases to extend the system lexicon.

Microphone – d.c. resistance 96 ohms signal on yellow, shield on green.
Left earphone – d.c. resistance 143 ohms connections blue & grey
Right earphone – d.c. resistance 143 ohms. connections red & white

The circuit diagram of this headset is shown below:

4.2.4 TRANSMITTER KEYING AND IMPEDANCE MATCHING UNIT  
The audio signal to be transmitted is attenuated by a passive preset potentiometer and the output impedance is converted by a transformer which also provides galvanic isolation between the PC and the output line.

Control of the PTT (press-to-talk) function and selection of primary or secondary transmitter is isolated from both the RS232 control lines and the transmitter by using opto-couplers for the RS232 input and change-over contact relay outputs. The PCB has positions for a two-pole changeover relay to be
implemented for each of the two functions. The PCB is organised such that the relay portion could be cut out to use chassis mounted relays driven from the PCB.

Power is provided by a CE marked PSU assembly taking 230V a.c. input and giving 12V d.c. at up to 1A. Alternatively a 12V regulator may be fitted on the PCB to accept a low voltage input in the range 17 to 25 volts d.c.

The transmitter selection and PTT functions are controlled by the operation of relays with changeover contacts, driven by the PC RS232 serial output control lines. The RS232 signals DTR and RTS drive opto-isolators that in turn drive the relays.

The audio signal circuitry provides galvanic isolation with level and impedance matching to render an output of 0dbm into a 600-ohm line for an on screen volume setting of 50 %.

The audio transformer has a centre tap connection that is used to carry a dc current via the audio pair for the purpose of operating the remote transmitter PTT function.(phantom signalling) A separate audio pair and d.c. return connection are used for each. Selection of the main or stand-by transmitter is made by the operation of the changeover relay contacts connecting the audio output to the required pair.

4.2.5 ATIS TRANSMISSION PC
An industry standard PC, connected via a Ethernet link to the ATIS Preparation PC, used to transmit the current ATIS message via its sound card.

4.3 HIGH AVAILABILITY ARCHITECTURE

4.3.1 POSSIBLE CONFIGURATIONS
- The table below describes possible equipment layouts.

<table>
<thead>
<tr>
<th>LAYOUT</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Single PC co-hosting ATISPREP and ATISTX (and/or ATISPSTN) No resilience to PC failure but resilience to transmitter failure is available if both channels are used. Transmission will need to be stopped while messages are created to avoid contention for the sound card.</td>
</tr>
<tr>
<td>2</td>
<td>ATISPREP and ATISTX on separate standalone PCs ATISPSTN could be co-hosted on either platform (or not configured at all).</td>
</tr>
<tr>
<td>3</td>
<td>ATISPREP, ATISPSTN and ATISTX on separate standalone PCs</td>
</tr>
</tbody>
</table>

Issue 08 – 24/07/2009
These configurations involve one or more of the following high-availability configurations:

- dual-redundant ATIS Preparation PC configuration
- high-availability ATIS Transmission PC configuration
- resilient PSTN connection.

These are described below

### 4.3.2 DUAL-REDUNDANT ATIS PREPARATION PC CONFIGURATION

A typical dual-redundant ATIS Preparation PC configuration is housed in two 19-inch cabinets. The system is supplied with dual UPS to provide at least 15 minutes power outage protection.

The rack-mount PC processor units installed in the cabinet share a single monitor and keyboard via video switch. This connects the video, keyboard and mouse ports of one of the PC processors to a single rack mounted keyboard and monitor, situated in the main rack.

The system uses the same A/B controller and H/W watchdog architecture as is used in standard dual redundant Copperchase AFGATE configurations. Refer to the AFGATE Technical Description for details.

### 4.3.3 HIGH AVAILABILITY ATIS TRANSMITTER PC CONFIGURATION

The high-availability configuration for the ATIS transmitter components must ensure that the audio lines to the radio transmitters are under changeover control as well as the ATISTX computers.
The high-availability ATIS transmitter comprises two computers and a transmitter control unit that provides watchdog and changeover control, audio output impedance matching and line protection from electrical discharge.

The system uses a spare serial port control signal (DTR or RTS) to indicate the software is running. The ATISTX application should toggle the control output signal at a regular interval, such as at each write of good status to the watchdog status file. The Transmitter control unit (TCU) will use this signal to re-trigger a hardware timer the output of which is processed by the changeover control logic. The TCU can return a signal to the ATISTX programs indicating if it is the Active or Standby unit. When an ATISTX program is updating the watchdog status file this information can be added within new XML tags. A remote monitoring program can then read the watchdog status file(s) for all the ATISTX programs to indicate their activity from anywhere across the network.

The transmitter control unit is a Copperchase proprietary equipment design based on the existing Copperchase AFSWITCH changeover and ATIS transmitter interface products.

The control unit comprises both watchdog and audio conditioning circuitry as depicted in the block diagram below:

1. Watchdog opto-isolated CMOS circuitry
2. Changeover logic CMOS circuitry and bi-polar relay drivers.
3. Latching relays.
4. Opto-isolated bi-bipolar RS232 to Relay drivers
5. Latching selection relay and non-latching PTT (press-to-talk) relay.
6. Passive impedance matching circuit and lightning protection
7. Passive impedance matching circuit and lightning protection

The watchdog and changeover circuitry are constructed on one PCB and the transmitter control and line matching on another.

4.3.4 RESILIENT PSTN CONNECTION

Advanced PSTN facilities can be used to provide resilient telephone access to high-availability ATISPSTN systems. The physical layout is shown below. Each ATISPSTN system is connected to a
separate PSTN line. Only one of these numbers is the published telephone number for access to the ATIS service.

Two possible solutions are:

1) Line 1 has call diversion on busy and on no-reply to line 2 but line 2 has no diversion.
2) Line 1 and line 2 form part of a hunt group with call diversion on no-reply to line 2 and call queuing on busy.

Note that the details of these facilities have been taken from BT’s FeatureLine product. Other national carriers will offer similar facilities.

The table below describes what happens in each solution for all possible circumstances when a customer dials.

<table>
<thead>
<tr>
<th>CASE</th>
<th>DIVERT SOLUTION</th>
<th>HUNT GROUP SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line 1 is free, ATISPSTN 1 is working</td>
<td>Caller is connected to ATISPSTN 1</td>
<td>Caller is connected to ATISPSTN 1</td>
</tr>
<tr>
<td>Line 1 is busy, line 2 is free, ATISPSTN 2 is working</td>
<td>Caller is connected to ATISPSTN 2</td>
<td>Caller is connected to ATISPSTN 2</td>
</tr>
<tr>
<td>Line 1 is busy, line 2 is busy</td>
<td>Caller is not connected</td>
<td>Caller is queued unless queue is full otherwise is not connected</td>
</tr>
<tr>
<td>Line 1 is busy, line 2 is free, ATISPSTN 2 is broken</td>
<td>Caller hangs receiving ring tone from line 2</td>
<td>Caller hangs receiving ring tone from line 2</td>
</tr>
<tr>
<td>Line 1 is free, ATISPSTN 1 is broken, line 2 is free, ATISPSTN 2 is working</td>
<td>Caller is connected to ATISPSTN 2</td>
<td>Caller is connected to ATISPSTN 2</td>
</tr>
<tr>
<td>Line 1 is free, ATISPSTN 1 is broken, line 2 is busy</td>
<td>Caller hangs receiving busy tone from line 2</td>
<td>Caller is queued unless queue is full otherwise is not connected</td>
</tr>
<tr>
<td>Line 1 is free, ATISPSTN 1 is broken, line 2 is free, ATISPSTN 2 is broken</td>
<td>Caller hangs receiving ring tone from line 2</td>
<td>Caller hangs receiving ring tone from line 2</td>
</tr>
</tbody>
</table>

### 4.4 SOFTWARE

#### 4.4.1 OVERVIEW

The ATIS software consists of applications (executables) which can be run on separate platforms or co-hosted on the same computer. These are:

- The Weather Editor application – for collecting or creating METAR observations;
- The ATISPREP application – responsible for converting received or user-generated weather reports in METAR format to an expanded text format and a digitised speech version of that text format ready for radio broadcast or telephone transmission;
- The ATISTX application – responsible for sending digitised speech messages to a radio transmitter;
- The ATISPSTN application – responsible for sending digitised speech messages to the PSTN on dial-up.

The software processes are supported by the Microsoft Windows Operating System which provides a simple graphical multitasking environment for the ATIS software components.
The Copperchase ATIS applications are written as 32-bit Microsoft Windows applications. Each application provides a normal mode of operation and password-protected supervisor mode for set-up and configuration.

The software applications communicate via a shared disk. They may co-reside on the same PC or run on separate platforms.

The ATISTX application supports two channels, TXA and TXB, which can output to two radio transmitters to provide resilience.

The figure below shows the interactions between these applications during normal processing of a METAR. It also shows ATISPREP generating output for the Copperchase D-ATIS (Digital ATIS Datalink system). This is a separate product – see separate datasheet.

4.4.2 THE WEDIT32 APPLICATION

The Copperchase Weather Editor allows the generation of METAR observations, and additional information for the ATIS system, based on:

EITHER

1) The receipt of a METAR/SPECI from an external AWOS or ASOS (in combination with operator entry of other weather observations, as necessary).

2) The receipt of weather data from a Copperchase METSYS system connected directly to one or more types of meteorological sensors (in combination with operator entry of other weather observations, as necessary). Note that the data received from MET sensors will have been checked for validity on its receipt by the configurable algorithms provided by the Copperchase METSYS system.
The Weather Editor may be configured for three modes of operation. These modes are:

- Manual Mode - This is the default mode and requires an operator to enter METAR details from instruments and observation and to queue the information manually.

- Attended Mode – In this mode, the Editor automatically collects METAR observations, typically from an Automatic Weather Observation System (AWOS), or from METSYS, and displays this in a formfill which mirrors the standard METAR format. The Editor informs the operator when a new observation is available. The operator adds any additional ATIS information and authorises the message for transmission. The message may be delivered as the operator authorises it, or at the next scheduled delivery time (which will typically be within a few minutes if the AWOS is configured to deliver new data 5 minutes before the next ATIS message is to be generated.)

- Automatic Mode – In this mode, no operator intervention is required. The METAR observation is collected automatically from an AWOS, or from the Copperchase METSYS system (which receives data from meteorological sensors), decoded by the Weather Editor and automatically sent to the AFTN and to ATISPREP with no operator intervention provided that the message has been successfully validated. If validation fails, the operator is alerted so that he can correct the errors and generate the message manually.

The Weather Editor user interface has the following features:

- The provision of a toolbar for frequently used commands.
- The ability to allow an operator to enter 3 character initials for use in a textual ledger.
- The use of tabbed dialogues to separate the main (mandatory) weather information, the runway information and the trend information.
- The ability to select from a list of stored METAR files.
- The ability to select the contents of the last METAR message. This message can be amended accordingly and retransmitted. This is useful when the weather is unchanged or has changed only slightly.
- The use of drop-down lists where possible to enable an operator to select values without the need to type in data. Such lists are configurable where this is appropriate.
Once a METAR and its associated information is selected for delivery/distribution, all the contents of the Weather Editor window are analysed to ensure that all the mandatory fields have been filled in. If any of these fields are found to be missing, a dialog box is displayed prompting the operator for input into this field. When all the mandatory fields are entered correctly and verified the information entered is distributed to the selected locations (AFTN, MET Displays or ATIS). Non-mandatory fields can be left blank.

The Weather Editor maintains a daily history database of all filed METAR information. This history database can then be used for statistical purposes.

The Weather Editor user interface has the following features:

- Extensive validation on data entry to prevent gross errors. Validation includes cross-validation between fields to ensure consistent data compliant with either FAA or ICAO recommendations. Some fields (e.g., QNH) are questioned if they vary by more than a defined threshold from a previous value.

If validation fails, the errant fields are highlighted, with an indication of the failure reason where possible, so that the operator can correct the data and continue with message generation. It is also possible to clear all the data by means of a menu option.

**4.4.3 THE ATISPREP APPLICATION**

ATISPREP constructs new ATIS messages for transmission based upon pre-defined ‘Message Templates’, which specify the content of the broadcast message.

When invoked from the Weather Editor, the currently selected message template is used to construct the new ATIS message. The new message will contain any ATIS text, together with any METAR information that has been decoded from the latest METAR.
The ‘Generate’ function EITHER:

- verifies the content of the message and confirms that all the appropriate recording files (WAV files) exist to convert the text to speech. Any text that does not have a WAV file is highlighted in red and a facility to record the missing word/phrase is provided.

OR:

- converts the ATIS message directly to speech using the voice synthesis facility if this option is configured.

The system may be configured so that the operator is forced to playback and listen to the message before authorising it for transmission, or configured so that transmission is authorised automatically without operator intervention provided that the message has been decoded without error.

The operator is able to playback the message. If some WAV files are not available then the playback operation will stop to allow the operator to record the missing WAV files.

Once the playback of an ATIS message has been verified, the message can be submitted for broadcast.

The ATIS toolbar provides easy access to the following functionality:

- **Generate** – This button causes a new ATIS message to be generated from the current template.
- **Print** – This button causes the current ATIS message to be printed.
- **Playback, Pause, Stop** Allows playback of the current ATIS message.
- **Record** – This button allows selected message text to be recorded by an Operator.
- **Submit to A/B** – These buttons allow the current ATIS message to be submitted to one of two transmitters for broadcast.

A number of ‘situation type’ templates can be defined for different forms of the ATIS transmission. Any one of these templates may be simply selected to modify the style of the ATIS generated by the system.
A template may specify that the ATIS broadcast should be output in more than one language or voice.

The ATISPREP application is also responsible for queuing the text form of the ATIS broadcast to the D-ATIS application, in either expanded or condensed form, in accordance with ICAO and EUROCONTROL recommendations.

It may also be used to send the condensed or expanded text in AFTN format to the standard Copperchase AFTN applications, to be routed to configurable AFTN address(es) or sent via AMHS using the Copperchase AMHSGateway application.

4.4.4 THE ATISTX APPLICATION

The ATIS transmission application ATISTX is responsible for controlling the playback of the ‘live’ or current ATIS message, and for controlling the hardware interface to the radio broadcast system.

ATISTX supports the concept of a configurable validity period for an ATIS report.

ATISTX plays the current ATIS message repeatedly, until a new message is presented to it for transmission, or until its validity period expires.

It may be configured so that, when its validity period does expire, it stops broadcasting completely or outputs a standard OUT-OF-SERVICE message, or carries on with the same message, ignoring the validity period.

ATISTX is designed to run largely unattended. However, it does provide a user interface which displays details of the current transmission status, the transmitter in use and the file being transmitted.

The interface also permits an operator to record and transmit a direct ATIS message in the case when the ATIS Preparation PC is not operational. Such messages can be played-back and listened to before being made available for transmission.
An operator can similarly record and transmit an out-of-service message.

4.4.5 THE ATISPSTN APPLICATION

The ATISPSTN application runs in conjunction with a PSTN interface card from Dialogic.

The Dialogic card is fitted into the PC running the ATISPSTN application(s) and provides a number of ports each of which provides a telephone connection to the PSTN (typically via a PABX). 2- and 4-port Dialogic cards are available. Each port is handled by a separate instance of ATISPSTN.

When the configured number for the ATIS PSTN service is dialled, the incoming call is answered by the Dialogic card which transfers control to the port’s ATISPSTN application. Upon receipt of this event, ATISPSTN looks in a configurable directory for the latest WAV file to play. If more than one file is found, only the latest message is selected. Any earlier files are deleted and an entry placed in the system log. ATISPSTN plays the current ATIS message repeatedly, with a configurable delay between repeats, until either:

- the caller hangs up
- the (configurable) number of repeats has expired.
- the ATIS operator forces the call to terminate by invoking the Force On-hook facility of the ATISPSTN GUI.

ATISPSTN is designed to run largely unattended. However, it does provide a user interface which displays details of the current transmission status and the file being transmitted. The interface also permits an operator to terminate a call forcibly.
4.4.6 ATIS TRANSMISSION HISTORY COMPONENT

The ATIS Transmission History component is a VB6 ActiveX DLL which may be instantiated by ATISTX or ATISPSTN. It provides a public interface supporting the reading and writing of the history archive and a GUI to display its contents. Contents may be viewed on screen, printed or played through an audio device.

Each transmission history list entry is stored as a record in a database. This database only contains the history list data elements; the WAV files are stored in a separate sub-directory and the (English) message text is stored in an ARC file. Each history list entry contains the offset and length of the associated text in the ARC file, which is named for the date of the archive in yyyyymmdd.arc format. The WAV files are stored in a separate directory also based on the archive date. Each WAV file is named based on the hex representation of the offset of its corresponding text file.

4.4.7 THE ATIS DATABASE

The ATIS database consists of the following tables which are used by the ATIS application in converting METAR weather information into broadcast messages:

<table>
<thead>
<tr>
<th>TABLE</th>
<th>USED FOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phrase</td>
<td>The Phrase table contains definitions of the standard phrases.</td>
</tr>
<tr>
<td>Special Phrase</td>
<td>The Special Phrase table contains those phrases available for use by the weather editor and also made available for use in templates.</td>
</tr>
<tr>
<td>Template</td>
<td>The Template table lists the available templates.</td>
</tr>
<tr>
<td>Languages</td>
<td>The Languages table lists all Languages available.</td>
</tr>
<tr>
<td>Translation table</td>
<td>The Translation table indicates the Languages to be provided by each template.</td>
</tr>
<tr>
<td>Login</td>
<td>The Login table provides a list of operators who can log in.</td>
</tr>
<tr>
<td>Wave Source</td>
<td>The Wave Source table provides the path to wave files used in construction of the output, dependent on the currently logged in operator in combination with the language being processed from the template.</td>
</tr>
<tr>
<td>Section</td>
<td>The Section table gives the textual description of the section, the ID of the template to which it belongs and the order in which it should be played.</td>
</tr>
<tr>
<td>TABLE</td>
<td>USED FOR</td>
</tr>
<tr>
<td>------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Section Detail</td>
<td>The Section Detail table contains a reference to each of the tokens currently in use and indicates the order in which they will be converted within their section. Each token has one of: - Punctuation, CWxValue, Phrase, SPhrase, Condition.</td>
</tr>
<tr>
<td>Punctuation</td>
<td>The Punctuation table defines the pause (in msecs of silence) in the output for each punctuation token.</td>
</tr>
<tr>
<td>Condition</td>
<td>The Condition table gives the label for the condition to be used in editing sections and the ID of the token for the value in the CWxValue table upon which the condition is dependent. The relationships and dependent phrases are obtained by querying the Condition Values table.</td>
</tr>
<tr>
<td>Token</td>
<td>Tokens have a label used in section editing and the field name to query the value in the current weather database.</td>
</tr>
<tr>
<td>Condition Value</td>
<td>The condition value table provides the information to determine the phrase or phrases to be included for different values of the CWx parameter. The relation field maybe:- Range, Text match, IsNull, IsZero, IsNonZero. (Note: a numeric match is a range where min = max, i.e. Range is (Min &lt;= CWxValue &lt;= Max) Phrase type is standard or special</td>
</tr>
</tbody>
</table>

The figure below shows the relationship between the entities which the database models. (Note that the voice synthesis option has been omitted from this diagram for the sake of clarity.)
4.5 ATIS OPTIONS

4.5.1 PSTN ACCESS
The Copperchase ATIS optionally provides a dial-in facility from the Public Telephone Network for access to the current ATIS message.

The PSTN Dial-In facility is installed on the ATIS TX PC and plays the same broadcast message that is transmitted by the radio equipment. The Copperchase ATIS supports up to 4-phone lines.

4.5.2 SEPARATE ARRIVAL AND DEPARTURE ATIS BROADCASTS
The Copperchase ATIS may be supplied with separate broadcast facilities for both Arrival and Departing aircraft. The content and text of the ATIS transmissions are created on the ATIS Preparation PC, but an additional ATIS Transmission PC connected to a radio transmitter is supplied to service the Departure ATIS broadcast.

The Copperchase ATIS allows the current weather information and aerodrome information from the Weather Editor. On completion of the data entry this information may be distributed to the AFTN and to also update the current ATIS transmission. This information may also be made available to other operational units within an aerodrome by means of Met Display Terminals located in those areas.
To view the distributed weather information, Copperchase supplies a viewing application, CPCBrowser, which provides a limited browsing capability only – menus/toolbars etc are not available. The main display page is a Dynamic HTML file so that it is also possible to view the data using any standard browser (eg IE4 or above, Netscape).

Foreground colours, background colours and fonts used in the display can easily be changed.

The displayed Met page inside the browser window is refreshed every 30 seconds. Any displayed values which have changed since the previous refresh will be updated, and marked to indicate that they have altered.

![CPCBrowser MET Display](image)

**Figure 3-1 MET Display.**

### 4.5.3 DATALINK ATIS (D-ATIS)

On many modern aircraft, the aircrew can request a textual copy of the current ATIS for a specific aerodrome via a facility called DATALINK. This request for the ATIS may be sent directly to the aerodrome or sent to a central database facility that acts as a repository for current ATIS. Both of the major aeronautical data communications network providers SITA and ARINC support a Data-Link Service for delivery of D-ATIS using the Aircraft Communications And Reporting System (ACARS). This service provides automated assistance to suitably equipped aircraft for requesting ATIS with the objective of reducing RT 'chatter', and aircrew and controller workload. The ATIS delivered via the Data-Link service may be stored within the Flight Data Unit within the cockpit of the aircraft where it may be subsequently displayed on-screen or printed by the aircraft crew.

The benefits of D-ATIS are:

- Reduced potential for communications errors between aircrew and controller via VHF radio.
- Reduced aircrew workload (e.g. reduced hand-copy of clearances and information, reduced voice communications monitoring and use).
- Reduced controller workload.
- Reduced radio channel load.
- Increased dialogue flexibility in case of non-routine communications.
The Copperchase ATIS can offer the D-ATIS facility via two methods, the **Direct Datalink method** and the **ARINC ATS Server method**.

The **Direct Datalink method** directly processes ATIS requests from aircraft, using the Wide Area Networks (WAN) communications facilities offered by both SITA (AIRCOM) and ARINC (Global-Link). The Copperchase ATIS system does this by making use of the **Copperchase ATIS-D product**, which is described in a separate Technical Description.

The communications protocols used for the dialogues with aircraft are those defined for the ATC Datalink services in the AEEC or ARINC Standards. The appropriate standards are:

- **ARINC 620** which defines the interface format of the communications envelope that is to be used when transmitting messages over the Datalink network;
- **ARINC 623** which defines the application text formats of the specific Air Traffic Services messages;
- **ARINC 622** which describes additional fields and processing required to construct a comprehensive Air/Ground message.

The **ARINC ATS Server method** does not enter into communications dialogues with aircraft for the delivery of the ATIS directly. Using this less sophisticated approach to the provision of D-ATIS, the Copperchase ATIS transmits a copy of the current ATIS message to the ARINC ATS Server over an available communications network, usually the AFTN. This is then stored at the ARINC ATS Server, and aircraft may then enter into 620/622/623 communication with the ATS Server for the Datalink version of the ATIS for the required aerodrome.

The D-ATIS message will be in abbreviated form and will be created using the same ATIS template as the voice ATIS message.

![Pilot's ATIS Request page on the MCDU](image)
SAS Boeing 767-383ER MCDU with ATIS message displayed.
Photo by Ottmar Raeymaeckers 1999.
5 SYSTEM MANAGEMENT AND CONTROL

5.1 OVERVIEW
The Copperchase ATIS System provides the following system management and control facilities available via its graphical user interface:

- the facility to run the system in either manual or automatic mode.
- the facility to edit templates for message generation
- the facility to edit the directory of phrases and to record new spoken phrases
- the facility to edit login details
- the facility to record OOS and IOS messages for use when the system experiences out-of-service or interruption-of-service events
- the facility to monitor and correct converted messages prior to transmission in speech format
- the facility to record broadcast messages directly in case the message-conversion facilities are out-of-service.
- the facility to manage the system log
- the facility to manage the archive of broadcast messages.
- database compaction and repair facilities.
- the facility to reconfigure a number of miscellaneous operational settings.

Each of these is described in detail in the following sections.

In a typical airport configuration, the ATISPREP application will be running in a manned environment while the ATISTX and ATISPSTN applications may be running in computers next to the appropriate transmission equipment in rooms which are not permanently manned. Hence most of the GUI is provided by the ATISPREP application.

5.2 MANUAL/AUTOMATIC OPERATION

In automatic operation, the ATIS application expects new METAR information to arrive automatically via AFTN to be stored in its database of current weather ready for conversion prior to broadcasting. It therefore polls the database regularly to determine whether new data has arrived.

In manual mode, it expects that an operator will generate new weather information by using the Copperchase weather editor and it therefore waits until it receives a notification from the weather editor indicating that new data is available.

The ATIS application provides a menu item which allows the operational mode to be changed from manual to automatic.

5.3 TEMPLATE EDITING

Conversion of weather information in METAR format to message text ready for broadcast is carried out using a message template (the current template) which defines how the conversion is to be performed. The message template specifies which phrases from the ATIS database and which fields from the current weather database are to be included in the message, and in which languages the message is to be spoken.

Different templates can be used for different weather conditions or operational situations.

Templates may consist of recorded text only with no parameters for special situations.

There is no limit to the number of different templates which may be created.

The ATIS application provides a GUI which allows the creation, deletion and modification of templates and enables the current template to be selected.
5.4 PHRASE EDITING

ATIS messages are built up from a dictionary of standard and special phrases. (Standard and special phrases are treated identically in the ATIS product; the difference between them is that special phrases are also used by the Copperchase WEDIT32 weather editor product whereas standard phrases are not)

Each phrase needs to be available in both (English) text format for display in the textual message and ideally as a digitised speech phrase in all of the operator voices for each language supported.

The ATIS product is supplied with a default speech set in English using a single voice, but the system will allow operators to record new speech phrases via a microphone and Microsoft recording software. This will allow operators to create new special phrases to cover the particular circumstances at their airport, or enable them to re-record the whole phrase set in different voices and languages if they wish.

The ATIS application provides a GUI for speech recording.

5.5 EDITING LOGIN DETAILS

The ATIS application holds details of the operators who are permitted to login and provides a GUI which enables these details to be amended, new operators created or existing operators removed. The login details comprise the operator identity, the operator initials which he uses to login, and the location of the spoken phrases for that operator for each supported language.

5.6 OOS AND IOS MESSAGE RECORDING

An OOS message may be played by the ATISTX application or the ATISPSTN application if they determine that the current weather message is out-of-date (i.e. older than a configurable setting).

ATISTX plays an IOS message when the secondary ATISTX in a high-availability configuration becomes primary as a result of a changeover.

The ATISPREP application provides the facility for an operator to record new OOS and IOS messages at any time.

5.7 CONVERTED MESSAGE CORRECTION

The ATIS application may be configured so that an operator must positively authorise a converted message for broadcast. The converted message is displayed in text form on screen and any phrases for which there is no digitised speech equivalent in the required voice (or at all) are highlighted. An operator may choose to correct the message, by editing the text or recording missing speech phrases, or listen to the spoken version locally, the before authorising its transmission.

5.8 DIRECT BROADCAST

The direct broadcast facility may be used when the ATIS Preparation Workstation (the computer on which the ATISPREP application runs) is out-of-service but the ATIS transmitter PC (the computer(s) connected to the radio transmitter on which the ATISTX application runs) is in service. The ATISTX application provides a facility whereby the operator can directly record the whole of a broadcast message (ie without using METAR format conversion) ready for broadcast.

5.9 SYSTEM LOG

A log is maintained of all significant non-message events that occur within the system. Each log entry records the date/time of the event, a description of the event, diagnostic codes, station/port/program that is reporting the event.

The log is presented to the Supervisor as a scrolling list with events colour-coded as to their severity (green - information, orange - warning, red - error). The operator is expected to check the log at frequent intervals and mark each event as being seen and dealt with (click on an acknowledgement field).

Any error events cause an audible indication which requires operator intervention to clear. Also any events which haven’t been cleared within a configurable time cause an audible indication.

5.10 BROADCAST MESSAGE ARCHIVE
The ATISTX application creates a daily archive directory containing both the text and spoken versions of every broadcast message. The online archive is kept until an operator chooses to delete it or copy it to an exchangeable media. Menu options are provided to copy daily archives to exchangeable media (CD-RW) and to delete copied directories. The operator can also view the text (and listen to the audio version) of archived reports.

5.11 DATABASE COMPACTON AND REPAIR

The ATIS application provides a menu item which allows the ATIS Access database to be compacted and repaired using a standard Microsoft utility.

5.12 RECONFIGURATION

The following tables show the configurable settings for the three software applications ATISPREP, ATISTX and ATISPSTN.

### 5.12.1 SETTINGS FOR ATISPREP APPLICATION

<table>
<thead>
<tr>
<th>ITEM</th>
<th>EXPLANATION</th>
<th>RANGE</th>
<th>DEFAULT</th>
</tr>
</thead>
<tbody>
<tr>
<td>+FCisTornado</td>
<td>TRUE to interpret +FC as TORNADO FALSE to interpret as WELL DEVELOPED FUNNEL CLOUD</td>
<td>TRUE</td>
<td>FALSE</td>
</tr>
<tr>
<td>Address Line 1</td>
<td>First AFTN address line for AFTN transmission</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AtisDBDir</td>
<td>Directory of the ATIS database</td>
<td>Valid directory</td>
<td></td>
</tr>
<tr>
<td>CurrentWeatherDir</td>
<td>Directory of the current weather database</td>
<td>Valid directory</td>
<td></td>
</tr>
<tr>
<td>DecodeFormat</td>
<td>Format for transmission of AFTN messages – either METAR for coded format or SPOKEN for verbose format</td>
<td>METAR</td>
<td>SPOKEN</td>
</tr>
<tr>
<td>DurationThreshold</td>
<td>Message duration in seconds above which a warning is given.</td>
<td>Number &gt;30</td>
<td>60</td>
</tr>
<tr>
<td>FAASpeakUnits</td>
<td>TRUE to speak the units, FALSE to omit them</td>
<td>TRUE</td>
<td>FALSE</td>
</tr>
<tr>
<td>ICAO Location</td>
<td>Id of this aerodrome</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LogDir</td>
<td>Location of Copperchase system log</td>
<td>Valid directory</td>
<td></td>
</tr>
<tr>
<td>MaxCurrentWxItems</td>
<td>Max number of character pairs to convert in a single weather group</td>
<td>Count</td>
<td>4</td>
</tr>
<tr>
<td>MissingOpPhraseBlue</td>
<td>TRUE to highlight in blue phrases missing from current login but present in default voice</td>
<td>TRUE</td>
<td>FALSE</td>
</tr>
<tr>
<td>OperatorVerification</td>
<td>TRUE if the operator must verify any message before it is submitted</td>
<td>TRUE</td>
<td>FALSE</td>
</tr>
<tr>
<td>Origin</td>
<td>AFTN originating address for AFTN transmission</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Password</td>
<td>Password for entering supervisor mode</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PhraseologyFAA</td>
<td>TRUE to indicate FAA format Only used during wind data conversion if format cannot be determined by other means</td>
<td>TRUE</td>
<td>FALSE</td>
</tr>
<tr>
<td>PressureText</td>
<td>MILLBARS or HECTOPASCALS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Priority</td>
<td>AFTN priority for AFTN transmission</td>
<td>FF, DD, SS, GG</td>
<td></td>
</tr>
<tr>
<td>PstnDir</td>
<td>Directory to which PSTN messages are submitted – if blank, PSTN delivery is disabled</td>
<td>Valid directory</td>
<td></td>
</tr>
<tr>
<td>RunwayTerse</td>
<td>TRUE if only runway spoken, FALSE if “Runway in use” spoken before runway number</td>
<td>TRUE</td>
<td>FALSE</td>
</tr>
<tr>
<td>SubmitDir</td>
<td>Directory to which radio messages are</td>
<td>Valid directory</td>
<td></td>
</tr>
</tbody>
</table>
### ITEM | EXPLANATION | RANGE | DEFAULT
--- | --- | --- | ---
Text Header | First line of AFTN text for AFTN transmission | Valid text | submitted.
ThresholdQFETerse | TRUE if only QFE value spoken, FALSE if preceded by "Threshold QFE for runway" | TRUE|FALSE | FALSE
TxDir | Directory for AFTN transmission (transmission disabled if blank) | Valid directory |
TxStn | Transmit station identifier for AFTN transmission | |
VVNotAssessed | Text for no vertical visibility | Any text | VERTICAL VISIBILITY CANNOT BE ASSESSED
WaveDir | Location of Wave Audio files | Valid directory | C:\CPCHASE\ATIS
WDogFileName | Name of shared status file | Valid path |
WDogStatusDir | Directory containing shared status file | Valid directory |
WDogWrite | TRUE if information is to be written to a shared watchdog file | TRUE|FALSE |
WindDirHundreds | TRUE if wind direction in multiples of hundreds spoken as hundreds, FALSE if spoken as separate digits. | TRUE|FALSE | FALSE
WindMaxText | Text for gusting wind | Any text | GUSTING

### 5.12.2 SETTINGS FOR ATISTX APPLICATION

| ITEM | EXPLANATION | RANGE | DEFAULT
--- | --- | --- | ---
Control Port | Control Port for the transmitters | 0 to 9 | 1
Delay | Delay period in seconds between successive transmissions | 0 to 10 | 3
LogDir | Log directory | Valid directory | C:\LOG
Password | Password for entering supervisor mode | |
PlaybackAction | Action to take if PlaybackMinutes is exceeded. C = continue to play the message for a further <PlaybackMinutes> S = stop play O = play an Out Of Service message | C | S | O | C
PlaybackMinutes | Number of minutes to play current message if no new one is presented | 0 to 120 | 60
SystemWavDir | Location of OOS, IOS and direct messages | Valid directory | C:\CPCHASE\ATIS
WDogStatusDir | Directory for watchdog status file | Valid directory | C:\CPCHASE\ATIS
WDogFileName | Name of watchdog file | Valid filename | WdogStat.txt
WAVDir | Directory where the WAV file can be found. | Valid directory | C:\CPCHASE\ATIS\SUBMIT
WDogWrite | TRUE if information is to be written to a shared watchdog file | TRUE|FALSE | FALSE

### 5.12.3 SETTINGS FOR ATISPSTN APPLICATION

| ITEM | EXPLANATION | RANGE | DEFAULT
--- | --- | --- | ---
AudioDeviceId | Device number of audio card used for output | 0 to 9 | 0
Delay | Delay period in seconds between successive transmissions | 0 to 10 | 3
LogEnabled | VoiceBox control logging turned on for diagnostics. | True | False | False
OOSDir | Location of out-of-service message | Valid | C:\ATIS
<table>
<thead>
<tr>
<th>ITEM</th>
<th>EXPLANATION</th>
<th>RANGE</th>
<th>DEFAULT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(oos.wav)</td>
<td>directory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PlaybackAction</td>
<td>Action to take if PlaybackMinutes is exceeded. C = continue to play the message for a further &lt;PlaybackMinutes&gt;, S = stop playback, O = play an Out Of Service message</td>
<td>C</td>
<td>S</td>
</tr>
<tr>
<td>PlaybackMinutes</td>
<td>Number of minutes to play current message if no new one is presented</td>
<td>0 to 120</td>
<td>60</td>
</tr>
<tr>
<td>Repeat</td>
<td>Repeat this message this number of times before auto-hangup.</td>
<td>0 to 10</td>
<td>3</td>
</tr>
<tr>
<td>RingBeforeAnswer</td>
<td>Number of rings before answering.</td>
<td>0 to 6</td>
<td>2</td>
</tr>
<tr>
<td>WAVDir</td>
<td>Path where the WAV files for playback can be found.</td>
<td>Valid path name</td>
<td>C:\CPCHASE\ATIS\PSTN</td>
</tr>
</tbody>
</table>
6 STANDARD PHRASES

ADVISE ATC THAT YOU HAVE COPIED INFORMATION
AIRFIELD INFORMATION
ALPHA
ALTIMETER
AND
AND PASS TOTAL NUMBERS OF PERSONS ON BOARD
AT
AT TIME
BECOMING
BLOWING
BRAVO
BROKEN
BROKEN AT
CAVOK
CENTRE
CHARLIE
CLOUD
CUMULONIMBUS
CUMULONIMBUS AT
DECIMAL
DEGREES
DELTA
DEWPOINT
DOWNWARDS
DRIFTING
DRIZZLE
DUST
DUST DEVILS
DUST STORM
DUST STORM
DUST WHIRLS
ECHO
EIGHT
EIGHTH
EIGHTHS
FEET
FEW
FEW AT
FIVE
FIVE
FOG
FOUR
FOXTROT
FREEZING
FROM
FUNNEL CLOUD
GOLF
HAIL
HAIS
HAZE
HEAVY
HEAVY THUNDERSTORM WITH HAIL
HOTEL
HOURS
HUNDRED
HUNDRED FEET
HUNDRED METRES
ICE CRYSTALS
ICE PELLETS
IN THE VICINITY
INCHES
INDIA
IS
JULIETT
KILO
KILOMETRES
KILOMETRES PER HOUR
KNOTS
LEFT
LESS THAN
LESS THAN 50 METRES
LESS THAN ONE QUARTER
LIGHT
LIMA
LOW DRIFTING
MAX
MAXIMUM
METAR
METRES
METRES PER SECOND
MIKE
MILE
MILES
MILLIBARS
MINIMUM
MINUS
MIST
MORE THAN
NINE
NO DEWPOINT AVAILABLE
NO SIGNIFICANT CHANGE
NOVEMBER
ONE
ONE
OSCAR
OVERCAST
OVERCAST AT
PAPA
PATCHES
PLEASE CONTACT ATC FOR CURRENT RUNWAY IN USE
QFE
QNH
QUARTER
QUARTERS
QUEBEC
RAIN
RECENT
RIGHT
RISING SAND
ROMEO
RUNWAY
RUNWAY IN USE
RVR
SAND
SAND STORM
SANDSTORM
SCATTERED
SCATTERED AT
SEVEN
SEVEN
SHALLOW
SHOWERS
SIERRA
SIX
SIXTEENTH
SIXTEENTHS
SKY CLEAR
SLEET
SLEET
SMALL HAIL
SMOKE
SNOW
SNOW GRAINS
SPRAY
SQUALLS
STATE OF SKY OBSCURED
SURFACE WIND
SURFACE WIND CALM
SURFACE WIND VARIABLE
TANGO
TEMPERATURE
TEMPORARILY
TEN KILOMETRES OR MORE
THOUSAND
THOUSAND FEET
THOUSAND METRES
THREE
THREE
THRESHOLD QFE FOR RUNWAY
THUNDERSTORM WITH DUST STORM
THUNDERSTORM WITH HAIL
THUNDERSTORMS
TO THE
TO THE EAST
TO THE NORTH
TO THE NORTH EAST
TO THE NORTH WEST
TO THE SOUTH
TO THE SOUTH EAST
TO THE SOUTH WEST
TO THE WEST
TORNADO
TOWERING CUMULUS
TOWERING CUMULUS AT
TREND
TWO
UNIFORM
UNKNOWN PRECIPITATION
UNTIL
UPWARDS
VARIABLE BETWEEN
VARYING BETWEEN
VICTOR
VISIBILITY
VOLCANIC ASH
WEATHER
WELL DEVELOPED
WHISKEY
WIND SHEAR
XRAY
YANKER
ZERO
ZULU
7 AVAILABILITY AND RELIABILITY CALCULATIONS

7.1 HIGH-AVAILABILITY ATIS MTBF CALCULATIONS

ASSUMPTIONS

1) Radio transmitters excluded from calculations

2) Failure of ATIS PREPARATION WORKSTATION leaves system in a state of reduced functionality in which broadcasts can still be transmitted so that no loss of service ensues.

3) ATISTX-1 and ATISTX-2 comprise a dual-redundant subsystem (dashed line) in which only one component need be operative to provide service.

4) MTBF and AVAILABILITY figures are calculated for the ATIS TRANSMISSION SUBSYSTEM (ie excluding ATISPREP, dotted line) and the full system (including ATISPREP)

5) MTBF figures for PCs are based on Copperchase field experience and quoted figures in technical literature (sparse). The MTBF figure for the TCU is based on Copperchase field experience with similar passive components. Both figures are reckoned to be conservative.

6) MTTR figures assume repair is by replacement of complete units by suitably–located spares. Conservative figures have been used.
<table>
<thead>
<tr>
<th>SYSTEM</th>
<th>MTBF (hours)</th>
<th>MTBF (years)</th>
<th>AVAILABILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATIS TRANSMISSION SUBSYSTEM</td>
<td>99996</td>
<td>11.4</td>
<td>99.994000</td>
</tr>
<tr>
<td>ATIS FULL SYSTEM</td>
<td>33333</td>
<td>3.8</td>
<td>99.976005</td>
</tr>
</tbody>
</table>

End of document