11 February 2026

TECHNICAL REQUIREMENTS DOCUMENT (TRD)
FOR THE
TMQ-53 / TACTICAL METEOROLOGICAL OBSERVING SYSTEM (TMOS)

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1.0 SCOPE

1.1 Identification. This technical requirements document (TRD) is applicable to the TMQ-53/Tactical Meteorological Observing System (TMOS) Modification.

1.2 System overview. The TMQ-53 will be deployed and maintained by Air Force Radar, Airfield, and Weather Systems (RAWS) personnel. The TMQ-53 will be capable of determining surface pressure, wind speed and direction, temperature, dewpoint temperature, relative humidity, precipitation accumulation and rate of fall, cloud coverage, cloud height, surface visibility, present weather, precipitation detection, and lightning (direction and range). The TMQ-53 must be able to facilitate tailoring of the sensor suite to meet specific mission requirements. The TMQ-53 must automatically collect, display and transmit data to computer based forecast systems. The program is limited to off-the-shelf components. The TMQ-53 will include a geo-locating and automated compass orientation (built-in or electronic) capability for platform location information.

In 2004 Air Force Weather Weapons System (AFWWS) required an expansion to the TMQ-53 to add the capability to disseminate formatted observations via the Iridium Satellite Communications System (Iridium). The capability must provide Combat Weather Teams (CWTs) deployed to remote or isolated environments the ability to transmit METAR and SPECI observations generated by the Enhanced Sensor Collection Appliance (ESCA) to the Air Force Weather Virtual Private Cloud (AFW-VPC) or equivalent, without human intervention.

The ESCA provides the following functions at each sensor location:

- Collects sensor data from local airfield sensors
- Formats sensor data in XML and sends it to the AF Department of Defense Information Network (DoDIN)
- Automatically generates observations from sensor data and submits them with or without user intervention
- Provides data to Airborne Forward Air Controller/Information Display System (AFAS/IDS) - (Air Traffic Control (ATC) tower) via a Machine to Machine (M2M) interface and Radar Approach and Control (RAPCON)
- Hosts an ATC display for sites with no AFAS/IDS system
- Hosts a real-time display and sensor data viewer to display local sensor data
- Records/logs a minimum of 30 days of sensor data from local airfield sensors

The TMQ-53 shall produce the following observations:

1.2.1 Raw data every 5 seconds and hourly observations while connected to an appropriate server.

1.2.2 Aviation Routine Weather Reports/Aviation Selected Special Weather (METAR/SPECI), the traditional weather message that is distributed via the Air Force/ NWS/FAA national circuits. METAR/SPECI reports are produced hourly and when special criteria are met.

1.3 Document overview. The purpose of this TRD is to document the full range of required capabilities of the TMOS.

Figure 1.2-1, TMQ-53 Block Diagram, indicates a typical TMQ-53 system configuration.

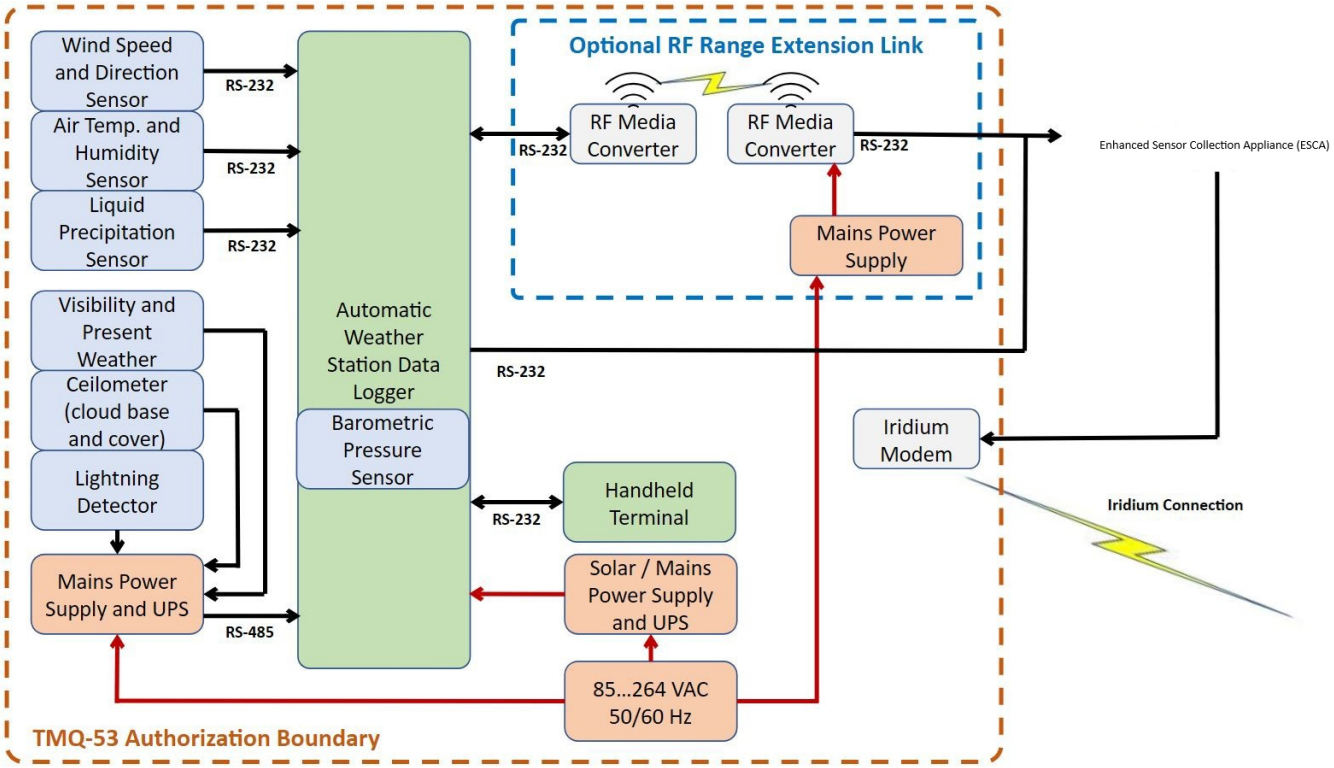


Figure 1.2-1 TMQ-53 Block Diagram

2.0 APPLICABLE DOCUMENTS

Federal Meteorological Handbook No. 1, “Surface Weather Observations and Reports,” July 2019.

AFMAN 15-111, “Surface Weather Observations,” 12 March 2019.

Weather Systems Support Cadre (WSSC) Concept of Operations (CONOPS)

AFMAN 24-604, “Preparing Hazardous Materials for Military Air Shipment,” 6 June 2025.

3.0 SYSTEM REQUIREMENTS

3.1 Weather Requirements. The weather requirements shall be collected by environmental sensors capable of measuring the required meteorological variables. These sensors shall provide signal outputs representing the sensed weather element data. Sensors shall comply with the functional and environmental requirements specified in Section 3.10 as well as the reliability, availability, and maintainability

performance specified in Section 3.9. Sensors selected shall be Federal Meteorological Handbook 1 (FMH-1) and World Meteorological Organization (WMO) compliant. Sensor data shall be encoded into digital form either at the sensor or in the system data logger.

3.1.1 Surface Pressure. Surface pressure must be determined to an accuracy of +/- 0.6 millibar (mb) between 640 and 1080 mb. The TMQ-53 must compute, display, and relay pressure altitude, density altitude, altimeter settings, and 3 hour pressure trend/tendency as well as surface pressure.

3.1.2 Wind Speed and Direction. The wind speed must be accurate to +/- 1 knot (kt) from 0 and 24 kts and accurate to +/- 2 kts from 25 kts to 70 kts. Prevailing wind direction must be accurate to +/- 5 degrees. Wind speed (including gusts and squalls) and direction must be reported and displayed in accordance with AFMAN 15-111. Wind sensors must be adjustable to a height range of 6 feet to 12 feet above ground level. The wind direction sensor shall be aligned to true north.

3.1.3 Temperature. Temperature must be accurate to +/- 1.0 degree (deg) Celsius (C) between -40 deg C to +50 deg C .

3.1.4 Dewpoint. The surface dew point must be determined to an accuracy of +/- 2 deg C from -20 deg C to +30 deg C. This parameter can be determined using temperature, relative humidity, and pressure.

3.1.5 Relative Humidity (RH). Relative Humidity must be displayed upon request and be accurate to +/- 5%. Operating range must be 5% to 100%.

3.1.6 Liquid Precipitation.

3.1.6.1 Must be able to measure liquid precipitation rate of fall up to 3 inches per hour and accurate to the nearest tenth of an inch. Must be able to measure liquid precipitation amounts and the water equivalent of freezing and frozen precipitation.

3.1.6.2 Must be able to measure a minimum amount of .01 inches liquid precipitation.

3.1.6.3 Must report liquid precipitation accumulations from past 24 hours.

3.2 Additional Weather Requirements

3.2.1 Cloud Base Height/Coverage/Vertical Visibility.

3.2.1.1 The cloud cover must be determined to a sky category of clear (no clouds), few (less than 1 okta to 2 oktas), scattered (3 to 4 oktas), broken (5 to 7 oktas), or overcast (8 oktas) from 100 feet to at least 10,000 feet (ft) or greater.

3.2.1.2 The cloud base heights and/or vertical visibility must be accurate to +/- 50 ft up to 5,000 ft, and +/- 100 ft above 5,000 ft.

3.2.1.3 Must be able to detect 3 different layers of clouds simultaneously from 100 feet

to 10,000 feet.

3.2.1.4 Eye Safety. The ceilometer sensor shall be designed to have accessible emission limits for laser radiation, with Class 3B maximum accessible emission level applied to direct viewing without optical instruments (excluding ordinary eyeglasses.

3.2.2 Surface Visibility. The surface visibility must be accurate to +/- 10 % of actual conditions. The range for visibility determinations must be from 0.0 kilometers (km to 10 km. Visibility must be determined in 0.1 km intervals from 0.0 km to 5 km and in 1.0 km intervals from 5 km to 10 km. Visibility must be reported in meters (m, nautical miles (nm, and statute miles (sm, selectable by the user.

3.2.3 Present Weather. Present weather and obscurations must be identified as fog, haze, or precipitation (rain, freezing rain, drizzle, freezing drizzle, snow.

3.2.4 Precipitation Detection. Precipitation type must be identified as liquid, solid, or freezing with 90% accuracy. Precipitation rate must be measured in increments of 0.1 inches per hour with an accuracy of +/- 10%. Precipitation amounts (liquid equivalent must be measured in increments of 0.01 inches with an accuracy of +/- 10% and measure up to 10 inches over a 6 hour period. The sensor shall report the start and end of a precipitation event within five minutes of the time that it occurs. Precipitation intensity must be identified as light, moderate, and heavy in accordance with AFMAN 15-111. Hourly, three, six, and 24-hour accumulation of precipitation (liquid equivalent of solid must be reported.

3.2.5 Lightning Detection System (LDS). Lightning detection system must detect cloud-to-ground lightning occurrences out to a minimum of 30 nm in all directions from the lightning sensor with an accuracy of +/- 0.5 nm.

3.3 Component Processing Unit. Each TMQ-53 must contain a component processing unit capable of consolidating inputs from all system sensors and provide single data stream outputs. This unit must be capable of connecting to a hand held display unit and a forecasting system by direct connection and Radio Frequency (RF). Each component processing unit shall incorporate built-in-test capability. Means shall be provided for bi-directional communication between the users and sensors with support for self-test. Testing of sensors shall not adversely affect the operation of sensors not involved in the test.

3.4 Employment

3.4.1 Set Up and Tear Down. The TMQ-53 will be capable of being set up or torn down by two people wearing full chemical protective clothing in 60 minutes or less. Set up and tear down will not require special tools not supplied with the TMQ-53.

3.4.2 Operators. The TMQ-53 will support one person operation once set up is complete.

3.4.3 Siting. Personnel will set up the TMQ-53 at a location as meteorologically representative as possible. Weather equipment must be adequately supported to be stable during high winds and be able to support system, ice and wind loads. These severe conditions are the very weather elements that the automated weather observing systems are supposed to measure and provide data for. The equipment mountings will be designed to support the desired equipment load to eliminate vibration and swaying which can result in erroneous readings.

3.5 External Interfaces. The TMQ-53 must be capable of interfacing with the ESCA or equivalent system.

3.5.1 TMQ-53 Information Flow. The flow of information goes from the sensors to the ESCA and to the Iridium SATCOM or NIPRNet. The TMQ-53 will interface with two modes of common user LAN connectivity:

The first common user connection, as identified in the TMQ-53 architecture is connected directly to the ESCA which may be connected directly to a base network that is connected to the NIPRNET. METAR and SPECI formatted information as well as real time sensor data will be sent to the AFW-VPC.

A second common user connection makes use of the Iridium SATCOM configuration. The Iridium gateway forwards the METAR and SPECI information to the AFW-VPC.

The ESCA will employ the software module to process and display sensor information. This information must be sent at a predetermined rate to the AFW-VPC.

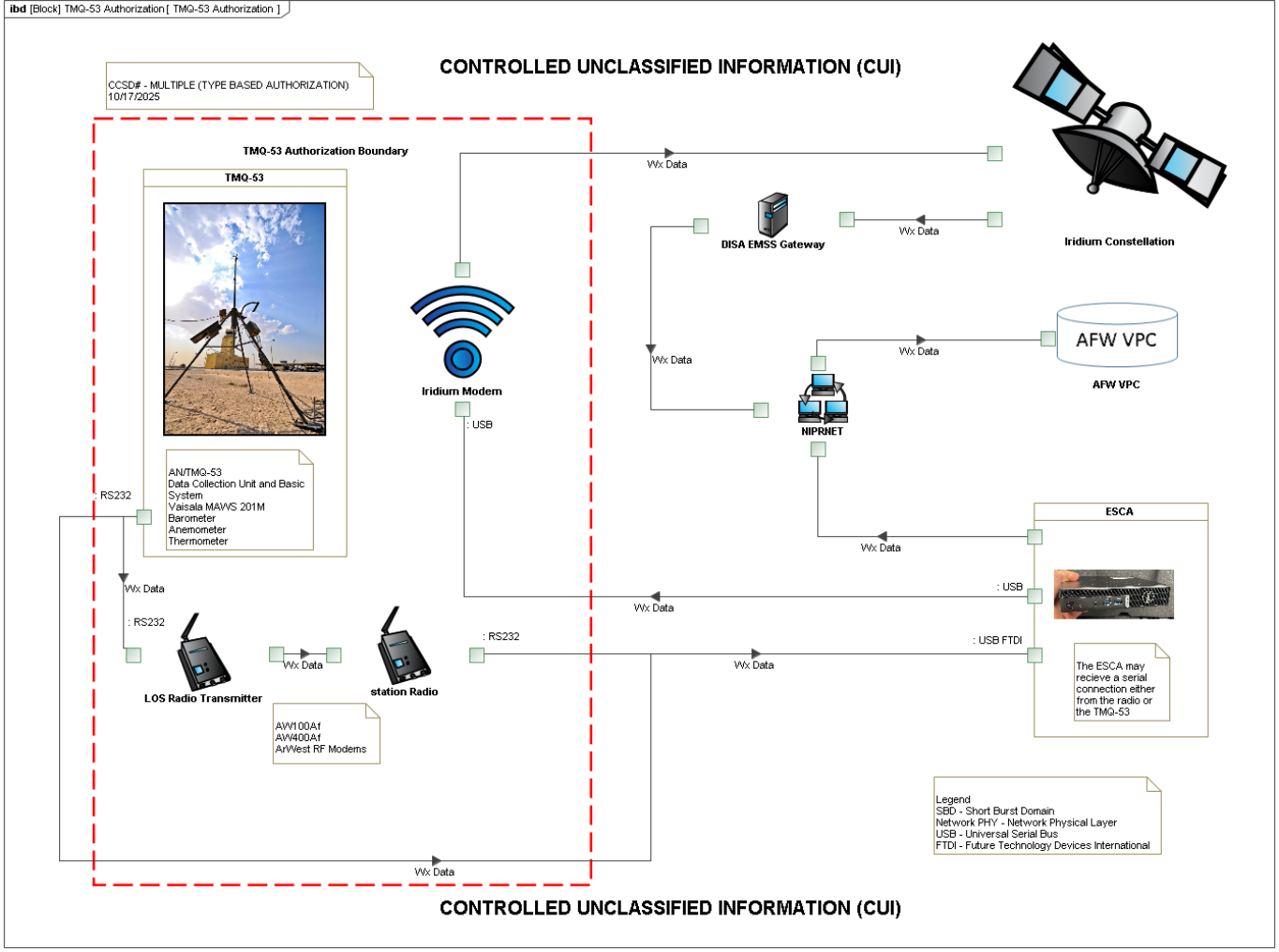


Figure 3.5.1-1: TMQ-53 Authorization Boundary Diagram

The following table lists external connections, data sensitivity, and security controls used to minimize risk.

Source	Destination	Mechanism	Data Exchanged	Security Controls	Data Sensitivity
TMQ-53	AFW-VPC via NIPRNet	Ethernet	METAR and SPECI formatted information	Host-based Firewall on dedicated interface on ESCA.	Unclassified
TMQ-53	AFW-VPC via Iridium Satellite	Serial	METAR and SPECI formatted information	Host-based Firewall on dedicated interface on ESCA.	Unclassified

3.5.2 Bridging Environmental Intelligence For Responsive Operational Support (BIFROST) Interface. The TMQ-53 shall provide processed data and formatted METAR and SPECI observations to the AFW-VPC for storage, display, and dissemination. TMQ-53/AFW-VPC interface shall provide a continuously updating ASCII text data stream in XML format. Data and observations will be displayed on BIFROST.

3.5.2.1 Processed Data. Data fields in the Identifier, Time and Wind groups shall be sent every 5 seconds to AFW-VPC. The frequency of this message delivery shall default to 5 seconds but be configurable in 5 second increments. The rest of the parameter groups shall be added to the message, at a minimum, every 60 seconds. The frequency of these parameter groups 7shall also be configurable by a Government System Administrator. The following table identifies the data that shall be sent:

Parameter Group	Parameter	Notes
Identifier	Active runway designation	
Time	Timestamp	The time that the processed data message was formed
Wind	Instant Wind Speed	The Instant wind measurements are actually a 5 second average of the measurements
	Instant Wind Direction	Directions should not be rounded.
	Instant Cross Wind	
	Running Average Wind Speed	2 minute running average
	Running Average Wind Direction	2 minute running average
	Running Average Cross Wind	2 minute running average
	Wind Variability	Per FMH-1
	Wind Gust	Per FMH-1
	Peak Wind Speed	Peak wind in the last hour
	Peak Wind Direction	Peak wind in the last hour
	Time of peak	Peak wind in the last hour
	Discontinuity and Midfield Winds	Same as primary sensor group
Temperature	Running Average Air Temperature	Running 5 minute average
	Running Average Relative Humidity	Running 5 minute average
	Running Average Dewpoint	Running 5 minute average
Pressure	Pressure at Field Elevation (Station Pressure)	All pressures are 1 minute averages.
	Altimeter Setting	1 minute average. Must be calculated from the station pressure
	Pressure at Sea Level	
	Pressure Altitude	
	Density Altitude	
	Pressure change in the last 3 hr	
Present Weather	AFMAN present weather identifier.	Shall be the same as the identifiers in the AFMAN 15-111 Table 10.1.

Parameter Group	Parameter	Notes
Precipitation	Rain accumulation in the last 1hr	
	Rain accumulation in the last 3hr	
	Rain accumulation in the last 6hr	
	Rain accumulation in the last 24 hr	
	Rain Rate	
Sky Condition	Vertical Visibility	
	Height base #1	Cloud heights should not be rounded.
	Coverage at base #1	See TRD 3.2.1
	Height base #2	
	Coverage at base #2	See TRD 3.2.1
	Height base #3	
	Coverage at base #3	See TRD 3.2.1
Visibility	1 minute average visibility	See AFMAN 15-111 Chapter 8
	10 minute average visibility	
Lightning	15 min. cloud to cloud flash count	
	15 min. cloud to ground flash/stroke	Bearing and distance 0-30 nautical miles

Table 3.5.2.1-1 Required Data

3.6 Communications. The TMQ-53 must communicate with computer based weather systems. Each TMQ-53 transmission must have identification tagged to each system and capable of remote activation from the weather systems. The TMQ-53 will interface with a remote display, the ESCA, which will have two-way connection back to the sensor suite and be co-located with the weather workstation, thus enabling the remote activation required by the user. The ESCA will then send the data via a network connection to the forecast system. This remote capability must be able to direct the TMQ-53 to observe and transmit at selectable time periods, to turn the system on and off, or hold transmission, and respond to automatic query of sensor status. The means of communication must be as follows:

3.6.1 Hardwire. The TMQ-53 must be capable of up to a 200 feet hardwire interface. This interface must allow data exchange between the TMQ-53 and both the ESCA and the hand held display device, with a minimum of one device connected at a time.

3.6.2 Radio Frequency (RF). The TMQ-53 must be capable of RF transmission and receipt up to a minimum of 5 nm. The TMQ-53 RF transmission frequencies must be adjustable to mitigate interference with other mission requirements.

3.6.3 Hand Held Display. The display must be easily readable under all light conditions, using US and metric units, and should have a dimming capability or cover for low light operations. The display will show a minimum reportable value for any and all sensors that comprises the TMQ-53.

3.7 Physical Characteristics

3.7.1 Weight and Volume. The total packaged weight of the TMQ-53 must be no more than 200 pounds, broken into packaged components that are two-person portable (i.e., no more than 84 pounds). The TMQ-53 must fit on 1/8 of a standard 463L pallet. The 463L pallet dimensions are 108 L x 88 W x 88 H inches.

3.8 Logistics and Readiness

3.8.1 Mission Reliability. The TMQ-53 must have a mission reliability of greater than 95 percent for a 30 day mission. This corresponds to a Mean Time Between Critical Failure (MTBCF) of 3200 hours. The critical path of the TMQ-53 consists of surface wind speed and direction, surface temperature, dew point temperature, surface pressure, and component processor unit, and the data interface with hand held display unit. A critical failure is any hardware degradation, indication of failure, or actual failure of the above parameters.

3.8.2 Availability (Up-Time Ratio (UTR)). The TMQ-53 must achieve at least 96 % UTR for the critical path. UTR is the percentage of time that operational equipment is able to satisfy critical mission needs relative to the designated operational capability.

3.8.3 Maintainability (Mean Repair Time (MRT)). The MRT must not exceed 30 minutes. This is the equipment corrective maintenance time. It includes all maintenance actions needed to correct a malfunction, including troubleshooting and removing and replacing LRUs. A LRU is defined as a single sensor or sensor suite that is plugged in or out of the component processing unit. MRT does not include Administrative Logistics Delay Time (ALDT).

3.8.4 Operator Maintenance. The TMQ-53 is highly modular and requires very little operator maintenance. Most maintenance will consist of removal and replacement of Line Replaceable Units (LRUs) and batteries. The deploying weather teams will maintain their equipment. If needed, they can contact RAWS personnel for maintenance assistance and ordering replacement LRUs.

3.8.5 Preventive Maintenance. Preventive or scheduled maintenance must not exceed 120 minutes per 30 day period for the critical path, when in an operational environment. The enhancements will add no more than an additional 120 minutes per 30 days.

3.8.6 Deployability. The TMQ-53 must be deliverable, worldwide, using air and surface transportation methods. The TMQ-53 must operate continuously for 30 days (with spares

and supplies) after a period of dormancy not exceeding 1 year (excluding replacement of batteries).

3.8.7 Failure Diagnostics Techniques. The TMQ-53 must be able to continuous self-detect and allow separate technician direct dialog to TMQ-53 components to diagnose possible sensor degradation, component processing unit errors, communication link problems, power interruption, and other failures. The TMQ-53 must display a human readable fault identification message. Field maintenance must allow for the removal and replacement of defective LRUs.

3.9 Critical System Characteristics

3.9.1 Environmental Conditions. The environmental operating conditions for the TMQ-53 routinely exposed to the environment: temperature range from -40 deg C to +50 deg C, humidity range from 5% to 100%, wind range from 0 kts to 70 kts, and altitude from –50 ft to 12,000 ft above Mean Sea Level. Exposed equipment must be able to effectively operate in blowing sand and dust, mist, salt spray, and in all forms of precipitation. TMQ-53 equipment must be protected against environmental contamination (snow, salt, precipitation, etc.) when configured for storage. Outside storage environmental conditions: temperature range from -40 deg C to +60 deg C, humidity range from 0% to 100%.

3.9.2 System Security. The TMQ-53 will operate at the unclassified level. The TMQ-53 will not process classified information. To reduce chances of detection on the battlefield, the system must possess a near silent, lightless capability. Components must emanate as little sound as feasible and any exterior lighting (on-site display/ manipulation devices) must minimize the chance of visual detection under all lighting conditions.

3.9.3 Nuclear, Biological, and Chemical (NBC). The TMQ-53 does not require special protection or hardening to survive in an NBC environment. If the TMQ-53 is deployed to a location that becomes affected by biological or chemical agents, operators will continue to use the system as long as they operate in that location.

3.9.4 Power. The TMQ-53 must be capable of operating from international commercial power sources (i.e. 110 to 120 VAC and 220 to 240 VAC, 50Hz - 60 Hz) AC power. This includes Government Furnished Equipment (GFE) field power generation equipment. The TMQ-53 must be capable of operating independent of an AC power source without interruption and not rely on the replacement of batteries (e.g., nickel/ lithium batteries, recharging batteries using solar power, etc.) for a minimum of 30 days in all deployed theaters. The TMQ-53 will rely on AC power, if required by the site, to power all components. When operating on AC power and it is lost, the TMOS's internal power source (i.e., solar power, batteries, UPS, etc.) must automatically ensure continuous operation for a minimum of 24 hours in a limited mode, if necessary (i.e., reduced operation of some non-critical sensors). Upon restoration of normal power after a shutdown, the TMQ-53 must automatically restart all functions. Failure of the UPS while commercial power is available shall not affect the operation of the TMQ-53.

3.9.5 Leap Year Calculations. TMQ-53 must accurately process date/time

data (including, but not limited to calculating, comparing, and sequencing) from leap year calculations, to the extent that other information technology, used in combination with TMQ-53, properly exchanges date/time with it.

3.9.6 Electromagnetic Interference. The TMQ-53 system shall be electromagnetically compatible within itself and with other systems in its operating environment. The operational performance shall not be degraded by electromagnetic environmental effects (E3). Systems will also comply with the applicable DoD, National, and International spectrum management policies and regulations.

3.10 Integrated Logistics Support

3.10.1 Maintenance Planning. The TMQ-53 will use a two level maintenance concept: organizational and depot level support. The maintenance concept for the TMQ-53 at the organizational level is for LRU removal and replacement, and preventive maintenance. Unserviceable LRUs will be sent to the depot.

3.10.2 Support Equipment (SE). Maintenance SE will be kept to a minimum. The maintenance concept will maximize the use of self-diagnostics, technical data, and resident and/or loaded diagnostic software to isolate to the LRU assembly.

3.10.3 Human Systems Integration. The TMQ-53 is being developed to allow fielding within current manpower constraints. It will be used for in-garrison (training) and deployed environments.

3.10.3.1 Training. Major Commands (MAJCOMs) will coordinate on operations and maintenance training requirements with Air Education and Training Command (AETC) via the formal training planning process. Instruction should provide tutorials and training for the general areas of training identified below. Specific training requirements will be developed by the Major Commands when a prototype system becomes available for use.

3.10.3.1.1 Operator Training. The need for Type III (resident) training will be assessed after receipt of the prototype system. If an AETC Supplemental Course is deemed necessary, the MAJCOMs will coordinate on operations and maintenance training requirements with Air Education and Training Command (AETC) via the formal training planning process. Training for this system may be integrated into existing AETC courses. Training requirements will focus on: set up/tear down, graphic user interface (GUI), product interpretation, system administration (if any), connectivity to standard weather systems, maintenance training including: fault detection/isolation, removal/replacement of LRUs, and preventive maintenance (if any), packing and transportation procedures, and review of the system CONOPS and Operations Manuals.

3.10.3.1.2 Unit Level Training. Qualification Training Packages (QTP's) will be developed by the government. QTP's will be completed at the unit level. Type IV (job-site/exportable) training material which is part of the QTP, will be developed to allow system familiarization training AF-wide at the unit level.

3.10.4 Other Logistics Considerations

3.10.4.1 Technical Data. Technical orders or vendor documentation for each level of operation and repair will include illustrated parts breakdowns, parts listings, theory of operation, and maintenance and troubleshooting guides.

3.10.4.2 Hazardous Materials. Design of the TMQ-53 will minimize the need for hazardous materials (i.e., batteries containing sulfuric acid) in the operation of the system as defined by AFMAN 24-604.

3.10.4.3 Resupply. The system shall be able to operate for 30 days without resupply. The need for resupply will be minimized.

3.10.4.4 Materiel Requirements

3.10.4.4.1 Unique or additional depot facility requirements. No unique depot or commercial facilities will be required.

3.10.4.4.2 Special packaging, handling, storage and transportation requirements. All systems (including the supplies, power sources, etc.) must be packed to withstand reasonable amount of shock and vibration.

3.10.4.4.3 Technical Orders. Technical order documentation for each level of operation and repair will include illustrated parts breakdowns, parts listings, theory of operation, maintenance, and troubleshooting guides.

3.10.4.4.4 Special requirements for disposal of hazardous waste. Operators will work with the local Bio-environmental engineering offices to dispose of environmentally hazardous materials such as batteries. The use of hazardous material in the TMQ-53 will be minimized.

3.10.4.4.5 Spares strategy. The contractor will maintain a Spares Management Program.

3.10.4.4.6 System warranties and guarantees. Specific system and assembly warranties will be obtained for TMQ-53 hardware. The TMQ-53 contractor will manage the warranty process for all components and sensors and be the single point of contact for warranty issues. (Operator/users will not contact or ship components/sensors directly to individual manufactures for warranty repair).

4.0 IRIDIUM REQUIREMENTS. The Iridium upgrade provides all hardware and software to interface a standard ESCA to an Iridium interface device, which establishes an IP connection between the ESCA and the DISA Iridium NIPRNET Gateway. The system must successfully transmit METAR and SPECI observations 95% of the time. Proposed solutions must meet the following requirements.

4.1 Physical

4.1.1 Iridium upgrade solution consists of at least three components: Iridium modem, Antenna, Software

4.1.2 Modem

4.1.2.1 The modem interfaces with the ESCA. In order to make the modem appear as a network connection, drivers must be provided that will integrate it to the ESCA.

4.1.2.2 External modem dimensions, including any non-removable cables, connectors or power adapter must fit within available space inside existing TMQ-53 transit cases (see Attachment 1).

4.1.2.3 Modem may be powered by either internal or external power supply and must be compatible with 100 – 240 VAC and 50 – 60 Hertz sources. It must contain a set of international power plug adapters to include, but not limited to; U.S, U.K, European and Asian plugs.

4.1.2.4 If external power supply is required, the power supply external dimensions, including any non-removable cables, connectors or power adapter must fit within available space inside existing TMQ-53 transit cases (see Attachment 1).

4.1.2.5 Modem must meet U.S. Government FIPS 140-2 wireless standards.

4.1.2.6 Modem must be compatible with the Defense Information Security Agency (DISA) Iridium NIPRNET Gateway (via use of DISA provisioned SIM Card).

4.1.2.7 Modem and any other “indoor equipment” will operate in a tactical office environment, including, but not limited to temperature extremes ranging from 20°F to 120°F and frequent power fluctuations.

4.1.3 Antenna

4.1.3.1 Antenna must be approved for continuous outdoor use and must be able to effectively operate in blowing sand and dust, mist, salt spray, and in all forms of precipitation.
4.1.3.2 Must be capable of communication with the Iridium Satellite Constellation from any location on the globe.

4.1.3.3 The antenna must be freestanding for use in a tactical environment, either with its own integrated mast or with a separate tripod mount. The antenna must not be integrated with the TMQ-53 tactical sensor suite.

4.1.3.4 Antenna and mount will be finished in field-neutral color (brown, tan or olive).

4.1.3.5 The antenna and mount, in the stored/transport configuration, must fit within available space inside existing TMQ-53 transit cases (see Attachment 1).

4.1.3.6 Antenna will be provided with a minimum of 50 feet of cable for remote positioning of the antenna from the modem. The cable will be finished in black or another field-neutral color (brown, tan or olive).

4.1.4 Environmental

4.1.4.1 The antenna must operate under the following environmental conditions:

4.1.4.1.1 Temperatures from -40 to +85 degrees C

4.1.4.1.2 Wind speed up to 70 knots

4.1.4.1.3 Elevations to 20,000 feet.

4.1.4.1.4 Relative humidity from 5% to 100%

4.2 Software
4.2.1 Any software will be compatible with the current government approved baseline Operating System.

4.2.2 Modem drivers will allow Linux operating system to utilize the Iridium modem.

4.2.3 Software will include an automated dialer program capable of establishing connection with the DISA Iridium gateway, completing transfer of all data and disconnecting from the gateway when transmission is completed. The system must be capable of repeating this process at least once every 5 minutes.

4.2.5 Dialer software will be configured to attempt transmissions only when sufficient signal strength is present. (Note: based on preliminary testing, we consider minimum signal strength as 2 out of 5 bars as seen on the Iridium phone.)

4.2.6 Software will include an Iridium satellite signal strength meter displayed within the Linux GUI.

4.2.7 Must be able to transmit 1-2kb text files using File Transfer Protocol (FTP).

4.2.8 The drivers cannot interfere with software operation and the user must be able to simultaneously view incoming information while it is sending the observation (i.e., it must be a background operation.).

5.0 NOTES

5.1 Reference Documents

Document No.	Title
AFMAN 15-111	Surface weather Observations
FMH-1	Federal Meteorological Handbook No. 1, Surface Weather Observations and Reports
AFPD 33-2	C4 Systems Security
AFI 21-116	Maintenance Management Of Communications Electronics
AFI 31-101V1	The Physical Security Program
AFI 31-209	The Air Force Resource Protection Program
AFI 31-401	Managing the Information Security Program
AFMAN 24-604	Preparing Hazardous Materials For Military Air Shipments
AFSSI 5001	System Security Policy Generation
AFSSI 5017	Deployable Computer Systems Security
MIL-STD-1472D	Human Engineering Design Criteria for Military Systems, Equipment, and Facilities

5.2 Abbreviations and Acronyms

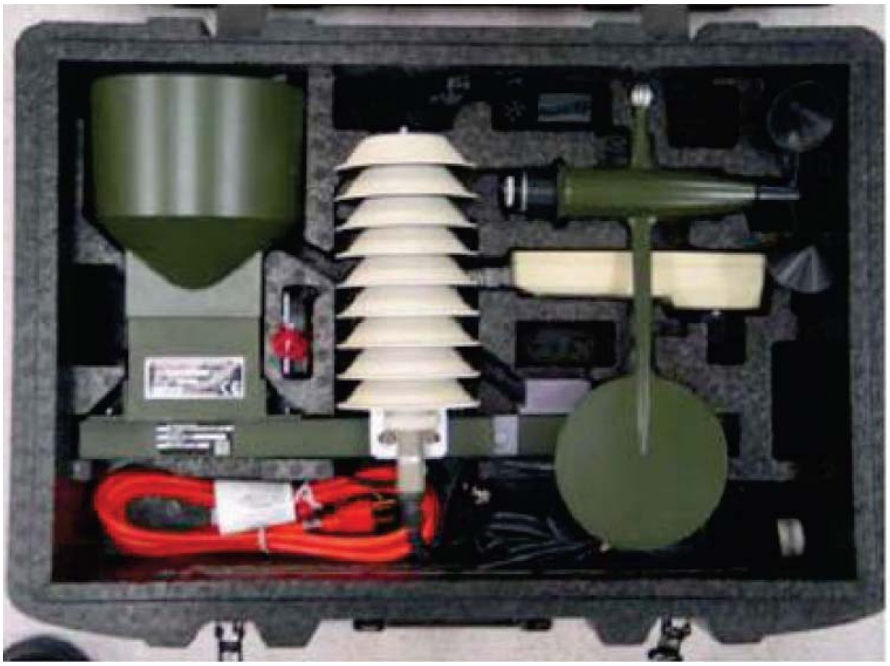
Abbreviation or Acronym	Meaning
AC	Alternating Current
AETC	Air Education and Training Command
AF	Air Force
AFI	Air Force Instruction
AFJMAN	Air Force Joint Manual
AFMAN	Air Force Manual
AFMC	Air Force Materiel Command
AFPD	Air Force Policy Directive

AFSSI	Air Force System Security Instruction
AFW	Air Force Weather
AFWA	Air Force Weather Agency
AGL	Above Ground Level
ALDT	Administrative Logistics Delay Time
avg	average
BIT	Built-in Test
BITE	Built-in Test Equipment
C	Celsius
CONOPS	Concept of Operations
COTS	Commercial Off-the-Shelf
DC	Direct Current
deg	degrees
DISN	Defense Information Systems Network
DoD	Department of Defense
EMP	Electromagnetic Pulse
ESCA	Enhanced Sensor Collection Appliance
ft	feet
GFE	Government Furnished Equipment
GT	Greater Than
GTE	Greater Than or Equal to
HQ	Headquarters
hr	hour
HSI	Human Systems Integration
IAW	In Accordance With
ILS	Integrated Logistics Support
ILSP	Integrated Logistics Support Plan
in	inch
km	kilometers
kt	knot
LRU	Line Replaceable Unit
LSP	Logistics Support Plan
LT	Less Than
LTE	Less Than or Equal to
m	meters
MAJCOM	Major Command
mb	millibar
METAR	Meteorological Aviation Report
min	minute
nm	Nautical Mile
MTBCF	Mean Time Between Critical Failure
MRT	Mean Repair Time
NBC	Nuclear, Biological, and Chemical
OJT	On-the-job Training
ORD	Operational Requirements Document
OT	Operational Test
RCM	Requirements Correlation Matrix
RH	Relative Humidity

SE	Support Equipment
TMOS	Tactical Meteorological Observing System
TBD	To Be Determined
TO	Technical Order
UPS	Uninterruptable Power Supply
USAF	United States Air Force
UTR	Up-Time Ratio
WSSC	Weather Systems Support Cadre

Attachment 1

QTR101 Basic Sensor Transit Case:



Dimensions:

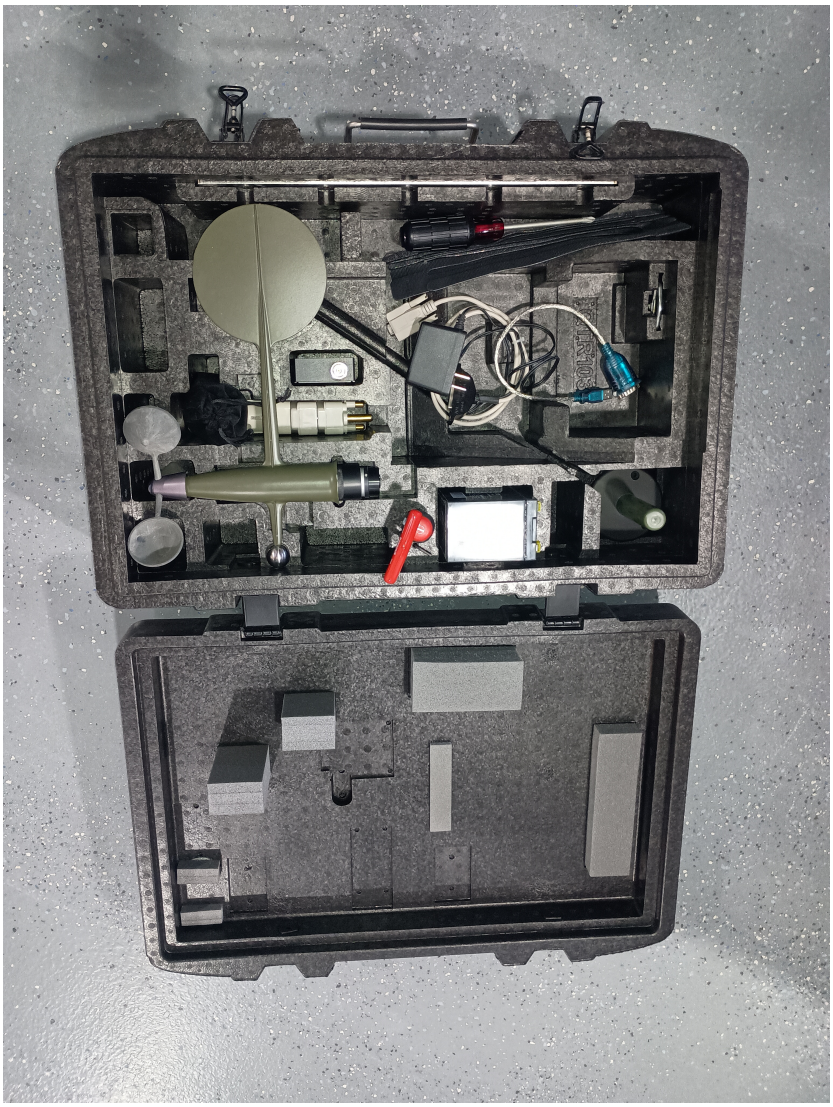
Length:	25.8 in
Width:	17.7 in
Height:	9.8 in
Weight:	22 lb
Volume:	2.59 cu ft

QTR102 Basic Tripod Transit Case:

Dimensions:

Length:	52.8 in
Width:	14.6 in
Height:	13.4 in
Weight:	77 lb
Volume:	5.98 cu ft

QTR103 Spares and Tool Kit Transit Case:



Dimensions:

Length: 25.8 in

Width: 17.7 in

Height: 9.8 in

Weight: 25 lb

Volume: 2.59 cu ft

QTR104 Ceilometer Transit Case:

Dimensions:

Length:	39 in
Width:	18.2 in
Height:	17.6 in
Weight:	68 lb
Volume:	7.23 cu ft

QTR105 Enhanced Power Supply Transit Case:

Dimensions:

Length:	39 in
Width:	18.2 in
Height:	17.6 in
Weight:	101 lb
Volume:	7.23 cu ft

REQUIREMENTS CORRELATION MATRIX

SYSTEM CHARACTERISTICS	THRESHOLD REQUIREMENTS	REFERENCES
1. Accuracy and Range		
a. Surface Pressure (paragraph 3.1.1)		
(1) Accuracy	+/- 0.6 mb	
(2) Range	640 mb to 1080 mb	
(3) Reported/Displayed	Altimeter setting (selectable, inches of mercury or millibars), Pressure altitude, Density altitude, 3 hour pressure trend/tendency, and surface pressure	IAW AFMAN 15-111
b. Winds (paragraph 3.1.2)		
(1) Speed		
(a) Accuracy	+/- 1 kt (0 to 24 kts); +/- 2 kts (25 to 70 kts)	
(b) Reported/Displayed		IAW AFMAN 15-111
(c) Gusts (Speed, Squalls)		IAW AFMAN 15-111
(2) Direction		
(a) Accuracy	+/- 5 deg	
(b) Reported/Displayed		IAW AFMAN 15-111
(3) Measurement Height	6 ft to 12 ft	
c. Temperature (paragraph 3.1.3)		
(1) Accuracy	+/- 1.0 deg C	
(2) Range	-40 deg C to +50 deg C	
(3) Reported/Displayed	to nearest whole deg C/F	IAW AFMAN 15-111
d. Dewpoint (paragraph 3.1.4)		
(1) Accuracy	+/- 2.0 deg C	
(2) Range	-20 deg C to +30 deg C	
(3) Reported/Displayed	to nearest whole deg C/F	IAW AFMAN 15-111
e. Relative Humidity (paragraph 3.1.5)		
(1) Accuracy	+/- 5%	
(2) Range	5% - 100%	
(3) Reported/Displayed	to nearest whole %	
f. Liquid Precipitation (paragraph 3.1.6)		
(1) Accuracy	+/- 0.1 inch	
(2) Range	0.01 to 3.0 inches/hr	
(3) Reported/Displayed	total precip for past 24 hrs to nearest 0.1 inch	IAW AFMAN 15-111
j. Clouds Base Height/Coverage/Vertical Visibility (paragraph 3.3.1)		
(1) Coverage	CLR, FEW, SCT, BKN, OVC	IAW AFMAN 15-111
(2) Heights (Bases)	100 ft to 10,000 ft	
(a) Accuracy	+/- 50 ft to 5,000 ft, +/- 75 ft above 5,000 ft	
(b) Layers	will detect all layers of clouds visible up to five	
(3) Reported/Displayed		IAW AFMAN 15-111
k. Surface Visibility (paragraph 3.3.2)		
(1) Accuracy	+/- 10%	
(2) Range	0.0 km to 10 km	
(3) Intervals Measured	0.1 km (0.0 km to 5.0 km)	
	1.0 km (5.0 km to 10.0 km)	

SYSTEM CHARACTERISTICS	THRESHOLD REQUIREMENTS	REFERENCES
(4) Reported/Displayed	Kilometers, nautical miles, or statute miles, user selectable	IAW AFMAN 15-111
l. Present Weather(paragraph 3.3.3)		
(1) Identification	Fog, haze, or precipitation (rain, drizzle,	
	snow, freezing rain, freezing drizzle)	
(a) Accuracy	90%	
(2) Reported/Displayed		IAW AFMAN 15-111
m. Precipitation Detection		
(1) Identification	liquid, solid, freezing	
(a) Accuracy	90%	
(2) Precipitation Rate	0.1 in/hr	
(a) Accuracy	+/- 10%	
(3) Precipitation Amounts	0.01 in	
(a) Accuracy	+/- 10%	
(4) Total Precipitation Amount	10 in/6 hr	
(5) Accumulation Reporting	Hourly, 3, 6, 24 hr (liquid equivalent of solid)	
(6) Intensity reporting	Light, moderate, and heavy	IAW AFMAN 15-111
(7) Reported/Displayed		IAW AFMAN 15-111
n. Lightning Detection (paragraph 3.3.5)		
(1) Type of System	Passive	
(2) Types of Lightning Detected	Cloud-to-ground	
(3) Range of Detection	30 nm radius	
(4) Ranging Accuracy	+/- 0.5 nm	
(5) Directional Accuracy	+/- 10 deg	
(6) Reported/Displayed	direction in degrees, distance in nm	This will be reported in remarks of the METAR observation
o. Hand Held Display (paragraph 3.5.1)		
(1) Readout	value for each sensor on system	
(2) Easily Readable	Under all light conditions	
(3) Standard Units of Measure	US and Metric	
2. Employment		
a. Set Up and Tear Down (paragraph 3.6.1)		
(2) full Chemical Protection Clothing	LTE 60 min	
3. Communications		
a. Hardwire (paragraph 3.8.1)	200 ft	
b. Radio Frequency (paragraph 3.8.2)	5 nm	
4. Physical Characteristics		

SYSTEM CHARACTERISTICS	**THRESHOLD REQUIREMENTS**	**REFERENCES**
c. Configuration (paragraph 3.9.1.3)		
(1) Weight	LTE 200 lbs	
(2) Max component weight	Two-person portable, LTE 84 lbs	
(3) Volume	1/8 pallet (standard 463L)	
5. Logistics and Readiness (paragraph 3.10)		
a. Mission Reliability	GTE 95% for 30 days	
b. Mean Time Between Critical Failure (MTBCF)	3200 hours	
c. Availability (Up-Time Ratio)	GTE 98%	
d. Mean Repair Time (MRT)	LTE 30 min	
e. Preventive Maintenance	LTE 120 min per 30	
f. Deployability After Dormancy (Up to 1 year)	Operate for 30 days	
6. Critical System Characteristics (paragraph 3.10)		
a. Environmental Conditions		
(1) Operating Conditions		
(a) Temperature	-40 deg C to +50 deg C	
(b) Humidity	5% to 100%	
(c) Wind	0 kts to 70 kts	
(d) Altitude	-50 ft to 12,000 ft MSL	
(2) Outside Storage Conditions		
(a) Temperature	-40 deg C to +60 deg C	
(b) Humidity	0% to 100%	
b. Power		
(1) Voltage	110-120, 220-240 VAC, 50/60Hz	
(2) Internal Power Supply Duration	24 hours limited	