SAFEair
[Operator]

Flight Operational Quality Assurance (FOQA)/ Helicopter Flight Data Monitoring (HFDM) Program
Sample Implementation and Operations Plan

Preamble: As an international effort the HFDM Toolkit will address a worldwide audience. In each case, the organization's state regulatory agency or body will provide specific guidance to implement an HFDM program. For instance, in the United States AC 120-82 is the foundation for an FAA-approved HFDM program. The UK CAA has published CAP 739 as the go-to source for HFDM programs. Likewise, JAR-OPS 1.037 provides HFDM guidance for many other international operators.

The following SAFEAir Implementation and Operations (I&O) Plan is an example of the required documentation of a FAA-approved HFDM program. The IHST recognizes that not all organizations will seek FAA-approval of their HFDM program. However, the IHST encourages organizations to utilize all available resources during the development phase of their HFDM program – preparing a similar document will provide the framework for a successful program. The I&O plan, or similar document is the blueprint or business plan for a successful, well thought out, HFDM program. All organization, policies, procedures, processes and protocol are covered in this plan.

Notes: Several textboxes will highlight the differences between approved and non-approved HFDM programs. Textboxes will also address significant differences in technology selection. Additionally, Heli-Facts will highlight interesting helicopter-specific information.

Example:

NOTE: FAA-only: Provision for FAA-approved program. Reference AC 120-82 to determine applicability to an informal, non-approved, HFDM program.

Disclaimer - Use of trade names: The IHST does not endorse any of the products or services highlighted in this document. Actual trade names are used throughout to illustrate an actual I&O plan rather than using acronyms or other generalities.

Omission of non-essential information: Throughout this document items such as the Revision Control Page and List of Effective Pages are omitted for space constraints.

Table of Contents

Table of Contents

1.0 Introduction

This Implementation and Operations (I & O) Plan describes the organization, technology, policies, procedures, and operational processes for the Flight Operational Quality Assurance (FOQA) program for SAFEAir. SAFEAir's FOQA program has been designated as the Helicopter Flight Data Monitoring Program, or HFDM program. HFDM program and FOQA are of the same meaning and may be used interchangeably. This I & O document also serves as the description of how the SAFEAir's HFDM PROGRAM complies with the provisions of 14 CFR Part 13.401, The FOQA Rule.

1.1 Background

Section 601(b) of the Federal Aviation Act of 1958 states: "In prescribing standards, rules, and regulations, and in issuing certificates under this title, the Secretary of Transportation shall give full consideration to the duty resting upon air carriers to perform their services with the highest possible degree of safety in the public interest." FOQA is defined as a program to improve flight safety by providing more information about, and greater insight into, the total flight operations environment; through selective automated recording and analysis of data generated during flight operations. Analysis of FOQA data can reveal situations that require improved operating; training; and maintenance procedures, practices, equipment, and infrastructure.

In support of the public safety objective, the FAA has publicly endorsed the development and implementation of voluntary FOQA programs as a tool for continuously monitoring and evaluating operational practices and procedures. In AC 120-59, Air Carrier Internal Evaluation Programs, the FAA states, "public safety is enhanced if deficiencies are identified and immediately corrected when they are discovered by the certificate holder rather than when they are discovered by the FAA." Programs like FOQA can provide the quantitative and objective information needed to identify deficiencies during the certificate holder's internal audit and evaluation process.

FOQA information can be included in the voluntary audits and evaluations described in AC 120-59, Air Carrier Internal Evaluation Programs, to determine the causes of deficiencies and to suggest enhancements to operating practices. Air carriers can avoid FAA penalty actions by reporting apparent violations identified by FOQA programs using the procedures outlined in AC 00-58, Voluntary Disclosure Reporting Program. FOQA data can then be used to monitor compliance with comprehensive fixes.

FOQA is based on the premise that an air carrier has prime responsibility for continuously monitoring and ensuring that its operations are safe and in compliance with its operating standards and the FARs. FOQA will assist SAFEAir in identifying and addressing operational deficiencies and trends that are not generally detectable with other procedures. Additionally, the availability of specified FOQA data to certain

regulatory authorities, manufacturers, and heliport/airport operators will help improve the safety and efficiency of the design and operations of Air Traffic Control (ATC) systems, aircraft, and heliports/airports. Many potential applications of FOQA data have been identified—ranging from safety considerations to evaluating training practices, operating procedures, aircraft engineering and maintenance, and aircraft design.

Several foreign air carriers have successfully implemented programs for using digital Flight Data Recorder (DFDR) data in a FOQA-type program for operational safety and performance improvements. Long track records of effectively using this information—over 30 years in the case of British Airways and Scandinavian Airlines System—have provided air carriers with clear evidence that data obtained in a FOQA program represents a source of valuable information that can contribute greatly to aviation safety when used appropriately. Air Carriers that currently have FOQA-type programs agree that the insights derived from these programs have prevented serious incidents and accidents and have led to improved operating efficiencies.

Heli-Fact: Helicopter operators in the North Sea supporting the Oil and Gas Producing (OGP) industry have operated HFDM programs for nearly a decade. Most mature HFDM programs rival that of their fixed-wing counterparts. Other segments beyond OGP are exploring HFDM programs.

In order to incorporate a HFDM program into their fleet operations SAFEAir was faced with a challenge. The SAFEAir fleet is comprised of three Eurocopter AS-350 and two Sikorsky S-76C+ aircraft that are not equipped with traditional DFDRs. Consequently, in order to be able to perform HFDM program operations for these helicopters without DFDR's it was determined that SAFEAir would need to procure a small light weight and cost effective recording device specifically for these aircraft and complete an installation under a FAA Form 337. This decision would allow SAFEAir to collect HFDM program information and provide additional oversight for single pilot aircraft that had not technically nor economically been feasible in the past. This operator felt that HFDM program for these aircraft would serve as an important demonstration for the Helicopter Emergency Medical Service (HEMS) community. As such, SAFEAir is considered a future case study for the International Helicopter Safety Team's (IHST) HFDM initiative. SAFEAir represents a small five-ship, hospital-based flight operation – these small 1-5 ship operations accounts for the vast majority of all helicopter flight operation organizations in the United States. Concurrently, SAFEAir is implementing a comprehensive Safety Management System (SMS), which will utilize HFDM information as a critical feedback mechanism providing oversight and accountability of their flight operations. This integrated approach to safety management will combine the resources of the FAA, SAFEAir and outside vendors providing third-party SMS integration and FDM data analysis services.

2.0 Helicopter Flight Data Monitoring Program

The I & O Plan presented in this document specifies the organization, technology, policies, procedures, and operational processes used for the SAFEAir HFDM program. Upon approval, SAFEAir will begin operations of the HFDM program. As of the issue date of this document, all five helicopters in the fleet have been equipped with the Appareo Aircraft Logging Event Recorder for Training Standardization (ALERTS) system. Within one month of the issue date data collection will begin on a trial basis and all personnel associated with the HFDM program will have been trained.

> **Heli-Fact:** GPS, MEMS technology, broadband, widespread internet access, powerful PCs and an emerging just safety culture have contributed to make HFDM programs affordable and feasible for all operators.

The core objective and intent of SAFEAir HFDM program is to facilitate the free flow of safety information. HFDM program will:

- Collect operational flight data to identify, evaluate and improve flight crew performance and needed improvements in training programs, the ATC system, helicopters and heliport/airport design,
- Develop methods to analyze the collected flight data such as triggered events and Routine Operational Measurements (ROM),
- Compare the collected data with established procedures and standards to identify needed improvements, and
- Perform trend analysis of HFDM Program data to identify potential problem areas, evaluate corrective actions, and measure performance over time.
- Use analyzed data in formal awareness and feedback programs to enhance safety in the following areas:

    1. Flight procedures,
    2. Flight training procedures,
    3. Crew performance in all phases of flight,
    4. ATC procedures,
    5. Aircraft maintenance programs,
    6. Helicopter design, and
    7. Heliport/Airport design and maintenance.

2.1 HFDM Program Stakeholders

SAFEAir will achieve significant benefits from the implementation of a properly constructed HFDM program. This program will provide large amounts of previously unavailable data to improve the problem identification and definition process and provide for assessment and resolution of systemic safety issues. Beneficiaries, or stakeholders, within SAFEAir include, but are not limited to:

- Flight Safety,
- Flight Training,
- Flight Operations,
- Aircraft Maintenance,
- Marketing, and
- Crewmembers including pilots and medical staff

2.2 Pilot Agreement

SAFEAir and the pilots (pilot group) employed by SAFEAir have developed an agreement to improve safety in air carrier operations. Through the collection of flight monitoring data made available by HFDM program. SAFEAir and the pilot group will be able to identify unreported safety issues and to correct these deficiencies through an integrated approach within the partnership framework. Data from the HFDM program will be proactively used to identify areas of operational concern and to develop corrective actions. This program will also be used to continuously monitor the effectiveness and adequacy of procedures or policies implemented as a result of the HFDM program.

Crucial to the success of the HFDM program are specific incentives that insure both SAFEAir and its pilots are protected from FAA certificate action or civil penalties as a result of information and data that are collected and analyzed by the HFDM program. In establishing these incentives SAFEAir and the pilot group have agreed to use this confidential data to conduct trend analysis of flight operations. This agreement establishes protective provisions endorsed by SAFEAir that no pilot shall except within the very limited provisions of Section 5 of the SAFEAir/Pilot agreement is subject to identification and corrective action by SAFEAir from data or information produced by the HFDM program.

SAFEAir will establish procedures for scheduled meetings to share aggregate HFDM program information with the FAA. These agreements will create a framework of

cooperation between the pilot group, the FAA, and SAFEAir that will permit the most effective use and analysis of HFDM program data under the Federal Protective Legislation, the *FOQA Rule* Part 49 U.S. C 40123 and CFR Part 193, described in subsection 2.2.1.2.

> **Heli-Fact:** FOQA or FDM programs, based on past airline experience, once were considered limited to operators with larger fleets and an organized labor group. Today, small operators with non-unionized employee groups are starting HFDM programs.

2.3 HFDM Program Agreement

The initial Helicopter Flight Data Monitoring Program Agreement was agreed upon and signed by the SAFEAir Director of Flight Operations and each individual pilot employed by SAFEAir. The original of these documents (and subsequent) are on file at SAFEAir. A copy of this document (and subsequent) is located in Appendix A of this Plan.

2.4 Protective Provisions (Incentives)

2.4.1 General

Key areas that were considered in developing the protective provisions for HFDM program include:

- Confidentiality – ensures that a specific crew cannot be associated with any FDM program data except as delineated under the provisions of the SAFEAir/Pilot Group HFDM Program Agreement.

- Anonymity – ensures that any identification of air carrier flight and/or flight crews with specific HFDM program flight data necessary during an analysis is eliminated permanently at the earliest possible time and in accordance with the provisions of the HFDM program policy.

- Data access and control – identifies data requiring protection and assigns overall responsibility for data protection. In addition, data access and control provides guidelines for procedures to protect data; provides authorized access to data, data processing, and storage locations; provides authorized access to reports and other data outputs; and ensures destruction of identifying data after retention period has expired. The HFDM program office will have security measures

controlled through restricted access to ensure only authorized personnel have access to HFDM program data, hardware, and software.

2.4.2 FAA Provisions

2.4.2.1 FAA FOQA Policy

The protective provisions of SAFEAir HFDM program are based on the protections detailed in the FOQA Rule, 14 CFR Part 13, Paragraph 13.401. issued on November 30, 2001.

2.4.2.2 Federal Protective Legislation

NOTE: FAA-only: Provision for FAA-approved program. Reference AC 120-82 to determine applicability to an informal, non-approved, HFDM program.

In the Federal Aviation Reauthorization Act of 1996, Congress included specific provisions pertinent to the public release of safety-related information that was voluntarily submitted to the FAA. Specifically, the Reauthorization Act added a new section—49 U.S.C. § 40123—to the FAA's governing statute to protect voluntarily submitted information when disclosure might inhibit further voluntary submissions and would adversely affect the ability of the Administrator to carry out safety and security responsibilities.

The Administrator has issued a rule, comprising FAR Part 193, which accomplishes the purposes set forth in this legislation. The rule describes the process for designating the kinds of information that would be protected. The final 193 rule on Protection of Voluntary Submitted Information was issued June 25, 2001.

The Administrator has published FAA Order 8000.81, the Designation of Flight Operations Quality Assurance (FOQA) Information as Protected from Public Disclosure under § FAR Part 193, Issued on 4-14-2003.

3.0 HFDM Program Components

The principal components that will comprise HFDM program at SAFEAir are described below.

3.1 Aircraft Fleet

Eurocopter AS-350 and Sikorsky S-76C+ aircraft equipped with the APPAREO Aircraft ALERTS system will be the launch aircraft type for the SAFEAir HFDM program.

The Eurocopter AS-350 and Sikorsky S-76C+ was chosen as the launch fleet for the following reasons:

- The fleet is utilized for HEMS operations; and it was determined that as the Eurocopter AS-350 and Sikorsky S-76C+ aircraft were all operated by a single crewmember the operational quality assurance of HFDM program would greatly increase the safety potential to our patients, passengers and crewmembers.

- The entire Eurocopter AS-350 and Sikorsky S-76C+ fleet is equipped with the ALERTS system. Five of these aircraft will be used to initiate HFDM program. Additional aircraft may be added to HFDM program pending approval from the HFDM Program Monitoring Team (HMT) as sufficient experience is gained on data acquisition and analysis. Future fleet plans include the addition of two Sikorsky S-76D aircraft to replace the S-76C+ aircraft. Additional fixed-wing aircraft or different aircraft types are being evaluated.

It is further planned to incorporate all future aircraft types operated by SAFEAir into the HFDM Program as soon as the aircraft are added to the operational fleet. Provisions for HUMS and HFDM will be included in the new Sikorsky S-76D fleet.

Airborne System

NOTE: Prior to selecting the airborne and ground components of an HFDM program an organization should conduct a fleet equipage survey. Not only to determine existing equipment, but to analyze future selections based on many factors such as fleet stability, emerging technologies, etc. Currently, airborne data collection systems are classified as traditional recorders (FDR, DFDR, combined CVDFDR, etc.) or light recorders (self-contained systems that may also include voice, data and image).

3.2.1 Eurocopter AS-350 and Sikorsky S-76C+:

The airborne components of the ALERTS system is comprised of an APPAREO Systems LLC (ASL) Geospatial Awareness Unit (GAU) co-located with an ASL Remote Memory Sub-system (RMS). Initially The GAU will provide detailed data as to geographic position, heading, groundspeed, altitude, climb/decent rate, G-loading, and attitude of the aircraft installed at a sample rate of 128Hz and recording rate of 4Hz to the RMS. The RMS records the data from the GAU on both internal and removable memory to be uploaded for analysis. The removable memory to be used is in the form of a commercially available 64 MB SD memory card. The ASL ALERTS system for SAFEAir HFDM program in its first iteration will be a stand-alone unit gathering all data internally from the GAU. Later in this program it is planned to integrate usage data from aircraft systems and collect health data into the RMS as well as a planned wireless data link capability for ease of data transmission.

3.2.2 Future Aircraft

The HMT will evaluate FDM system integration on all future aircraft types. The new Sikorsky S-76D aircraft will be equipped with an integrated Honeywell HUMS and HFDM system.

3.3 Airborne System Maintenance and Support

The ALERTS will be maintained per the FAA approved SAFEAir Aircraft Maintenance Program. SAFEAir Aircraft Maintenance will be responsible for managing this process. The assemblies will be a Line Replaceable Unit (LRU) designed to be easily replaced in the event of malfunction. The HFDM Program Analyst will be responsible for coordinating maintenance issues with the Director of Maintenance regarding GAU problems discovered during data analysis.

3.4 Ground Data Replay and Analysis System

The Ground Data Replay and Analysis System (GDRAS) are designed to process and analyze data from all ALERTS-equipped aircraft in the SAFEAir fleet. This Web application uses protective mechanisms, including removal of identifying information in accordance with the provisions described in Section 2.2. The proposed final installation at SAFEAir includes one off site server, Remote Data Kiosk's (RDK) at one location, one workstation and one notebook computer. The server, the notebook and workstation will utilize Microsoft's Windows XP operating system. The server will do the processing for the Flight Data Storage (FDS) component of Event Management System (EMS) and

serve as the database server for the network. The FDM Program Analyst utilizing the ASL Flight Analysis System (FAS) software at a workstation, secured at SAFEAir, will review the processed data. The notebook computer will facilitate crew contacts when required. Additional Program Analyst employed a third-party FDM analysis services vendor and contracted through SAFEAir will validate, classify, analyze and report information from remote locations. The components of the GDRAS are as follows:

3.4.1 Remote Data Kiosk (RDK)

The ASL RDK is designed to receive raw data, pre-process and upload that data from all ALERTS equipped aircraft in the SAFEAir fleet. Field maintenance personnel as part of the regular maintenance service checks will upload data from each aircraft into the RDK, via a SD Card. This data will be pre- processed and uploaded via a secure Internet connection to the Flight Data Storage server. Initially, only one location has been identified (SAFEAir). This system will be employed to minimize media handling logistics and improve the timeliness of data collection. Future iterations of the RDK shall include a wireless data link capability for ease of HFDM program data from ALERTS equipped aircraft while on the ramp/helipad and in proximity of the receiver.

3.4.2 Flight Data Storage (FDS)

The APPAREO Systems WEB Analyzer (ASWA) an encrypted, password protected multifunction web based server located off sight will store and process data from the RDK's as it is uploaded. The processing of this data is automated and occurs without operator intervention. The software allows the user to configure and monitor the processing and also includes a database explorer program for performing analysis. ASWA provides the ability for the user to configure the system for SAFEAir fleet, aircraft, and logical frame layouts. The ASWA also includes a Profile Editor to allow the user to configure the analysis profiles. It supports all recorded parameter types, as well as providing for computed parameters that are useful for analysis

The APPAREO Event Management System (AEMS) is a highly configurable and automated system for event detection. The system operates against the database of events detected by the APPAREO Profile Measurement system (APM) and provides an interactive tool for the trending, review, and analysis of the located events. AEMS can support multiple event monitoring profiles; for example, special studies and evaluation profiles can be run in parallel with the ongoing standard event profile. Each profile has its own database of event definitions.

The APM system provides for parameter measurement, event detection, and database analysis. The parameter measurement capabilities allow the user to detect and measure flight aspects automatically. The software then allows for event detection, using event definitions that can be readily configured by the user. The event detection capabilities are very extensive and highly configurable. The database analysis capabilities of the system allow the user to perform trending and characterization of the results database. The Flight Data Viewer (FDV) component provides the analyst with the capability to extract and view limited de-identified data from individual events.

3.4.3 System Ware

Flight animation software will provide better methods for communicating and visualizing flight data and aircraft performance. After a rigorous selection process, SAFEAir has chosen ASL as the vendor best able to meet the needs of SAFEAir HFDM program. The ASL Flight Analysis System (FAS) software will be used to animate HFDM program data for use in a number of areas. These animations will be used to debrief crewmembers about events triggered on operational flights and may be used in initial training, recurrent training, incident analysis, and airport/helipad familiarization. Other applications of this capability will also be considered, pending approval of the HMT.

ASL, in partnership with SAFEAir and other ALERTS users, will also develop an interface that will use data output directly from FAS to create an animation in a more portable file format that can be viewed on less capable computer systems. Animation products, e.g. AVI files, may be a solution developed that can be shown on personal computers and integrated with flight simulators to assist in creating training scenarios based on real operational events.

In addition, SAFEAir and other ALERTS users will also team with ASL in the development of an enhanced analysis and visualization capability that facilitates the use of flight animation and simulation for interpreting and communicating operational issues. SAFEAir and other ALERTS users and ASL will also team to develop a database to correlate HFDM program data for additional uses as technology permits.

3.5 Other Equipment

SAFEAir will be investigating several other components to incorporate into FDM program as the technology becomes available and requirements are identified and refined. Addition of these components is subject to approval by the HMT:

- De-identified data collection from flight simulators and

- Remote data collection including secure transmission systems, and potentially Wireless Data Link (WDL) systems.

- Advanced GDRAS to analyze S-76D flight files.

3.6 Equipment Upgrade, Modification, or Replacement

The equipment used initially in HFDM program, including both airborne and ground systems, may be upgraded, modified, or replaced with equipment from the same or a different vendor that will provide comparable or superior functionality to the equipment described in this section. Documentation of such changes in airborne or ground systems will be maintained in the HFDM program office and will be made available to the FAA on request. This I & O Plan will be revised and submitted to the FAA whenever changes to airborne or ground-based systems are made.

> **Heli-Fact:** The IHST maintains a listing of available HFDM resources in the Appendix section of the IHST HFDM Toolkit and online at www.isht.org.

3.7 HFDM Program System Architecture

Figure 1 – A diagram depicting the HFDM Program System Architecture is provided below.

SAFEAir HFDM Program System Architecture

ASL Flight Analysis System (FAS) - on Notebook Computer

SD card can be loaded directly into FAS to facilitate training debriefs from SAFEAir Check Airman.

Data from ALERTS (GAU 2000) uploaded into RDK via SD card.

Remote Data Kiosk (RDK)

Remote Data Kiosk process and transfer data to central location via secure internet connection

Secure server with Event Measurement Software (EMS) - located in Fargo, ND

GDRAS component for analysis, debrief and reporting

SAFEAIR

SAFEAir HFDM Program

HFDM Analysis Services

SAFEAir oversees HFDM program, provides input to all stakeholders and serves as the "gatekeeper" providing crew debriefs and training.

Third-party provides analysis, validation, classification and reporting of HFDM events. Reporting includes:

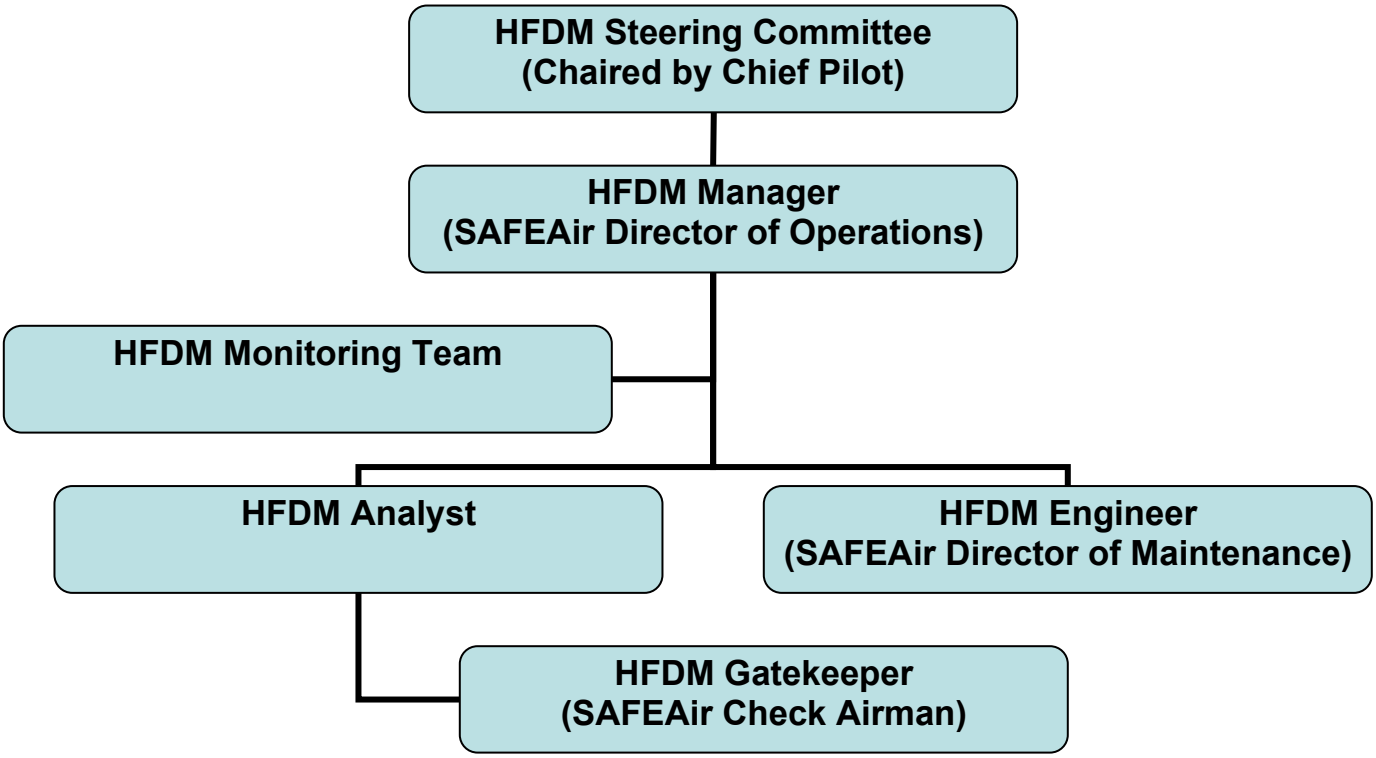
1. Scheduled Reports (monthly)
2. On-demand reports
3. Electronic notification of exceeded aircraft limitations.

4.0 HFDM Program Organization

Organizational Structure

The SAFEAir HFDM program organization structure is illustrated in **Figure 2** below.

Figure 2—HFDM Program Organizational Structure



4.2 HFDM Program Steering Committee

A HFDM Program Steering Committee, chaired by the Chief Pilot, serves as a high-level advisory group. Members of the committee include the Director of Flight Operations/Director of Safety, Flight Data Monitoring Program Manager, and SAFEAir Check Airman (or their designated representatives) and Line Pilot Representatives. The duties of this committee are:

- Establish all de-identification procedures and all data security and data retention policies and procedures;

- Define the mechanisms for educating pilots and other stakeholders;
- Determine methods to be used to solicit user needs;
- Solicit and review user needs;
- Review new program capabilities;
- Oversee the HFT;
- Oversee in the integration of HFDM program, and Audit Programs within the SAFEAir Safety Program; and
- Perform other duties as deemed necessary by the committee.

The Steering Committee will meet quarterly or as determined by its chairman.

4.3 HFDM Program Monitoring Team (HMT)

An HMT, chaired by the Manager, Helicopter Flight Data Monitoring Program, conducts reviews of aggregate trend data to identify safety recommendations to stakeholders. The HMT includes the HFDM Program Analyst, a Check Airman designated by the Director of Operations and the HFDM Program Systems Engineer. The duties of this team are to meet once per month (or as necessary) to:

- Determine program startup criteria,
- Develop and manage policies and procedures for HFDM program password selection and maintenance,
- Develop, assess, and modify ROM definitions,
- Analyze ROM to form a baseline,
- Continuously review and revise exceedance levels derived from the ROM,
- Validate and analyze exceedance events,
- Determine procedures for crew contact,

- Identify systematic safety, training, ATC, and maintenance issues requiring stakeholder attention,

- Recommend corrective action to appropriate SAFEAir departments after analysis of HFDM program summaries and request that these departments respond within a specified number of days as to the disposition of the recommendation,

- Review corrective action to resolve systematic problems discovered by HFDM program to include coordination with appropriate agencies with oversight of areas outside of SAFEAir,

- Evaluate effectiveness of recommended corrective actions,

- Establish and implement education processes for stakeholders,

- Define and implement procedures for appropriate data sharing with stakeholders, and

- Evaluate new technologies to enhance HFDM program.

4.4 Chief Pilot

The Chief Pilot chairs the HFDM Program Steering Committee and lends overall guidance and coordination to HFDM program. He/she is instrumental in the education and communication regarding HFDM program to the pilot population. He/she is responsible for:

- Education and communication regarding HFDM program to the pilot population and other stakeholders,

- Integration of HFDM program into the existing flight safety risk assessment process, and

- Make decisions solely using de-identified data as to the need to release the confidentiality of individual pilot for directed training as per the HFDM program Agreement above Paragraph 2.3 sub paragraph 3 (a)

4.5 Manager, Flight Data Monitoring Program

The Manager, Flight Data Monitoring Program, who reports to the Director, for Flight Operations, SAFEAir, leads the SAFEAir HFDM program operation. The Manager is responsible for:

- The overall administration and operation of HFDM program;
- Overall budgetary oversight of HFDM program.
- Assuring HFDM program serves the needs and reporting requirements of the flight operations, training, safety, maintenance, and engineering departments;
- All HFDM program communication with the FAA, pilot group, ASL, vendors, and other external entities;
- Overseeing data collection and retrieval, data security and protection, data reduction and analysis, assessment of deviations and trends, corrective actions and feedback, and data trending and record retention;
- Overseeing the verification, accuracy, and validation of data used in any analysis or animation;
- Overseeing the duties of the HFDM Program Analyst; and
- Establish and monitor a training program for all members of the HFDM Program Department to stay up to date with changes that periodically will occur within the program.

4.6 HFDM Program Analyst

The Analyst, Helicopter Flight Data Monitoring Program, will conduct all routine event validation and analysis processes. Currently the function of HFDM Analyst is contracted to a third-party Flight Data Management company. The HFDM Program Analyst will provide information to the *Gate Keeper* to contact and de-brief crew members concerning HFDM program events while adhering to the same confidentiality constraints described in AC 120-82, Appendix A, 7, 4. The HFDM Program Analyst reports to the Manager, Helicopter Flight Data Monitoring Program, and is responsible for:

- Day-to-day operations of the HFDM Program System,
- Overseeing data collection and retrieval, data security and protection, data reduction and analysis, assessment of deviations and trends, corrective actions and feedback, and data trending and record retention;
- Processing all data obtained from airborne data acquisition equipment,
- Managing the flow of HFDM program data, including processing by the analysis system,
- Screening data to ensure its accuracy and integrity,
- Generating HFDM program related reports,
- Handling special data requests,
- Overseeing media handling procedures,
- Defining, interpreting, and fulfilling stakeholder requests for HFDM program data,
- Maintaining the HFDM program workstation—i.e., organization and security, storage, and retrieval of reports,
- Overseeing the installation and set-up of all HFDM program equipment—including FAS hardware and software,
- Coordinating with maintenance on airborne data systems, including parameter selection and validation,
- Assisting the HMT in reviewing and analyzing data,
- Managing, maintaining, and securing trend and event databases,
- Development and maintenance of historical record of all changes and modifications made to the event sets, including the reasons for those modifications;
- Development and maintenance of appropriate documentation of HFDM program operation including controlled documents;

- Using data and trend analysis software to generate periodic reports for program analysis,
- Control access to identified data, in accordance with the HFDM program,
- Verify data identification and security features for various system components,
- Support Gatekeeper during any necessary crew contacts, and debrief as necessary
- Designing and implementing systems for allowing secure network access to HFDM program analysis and reports.

4.7 HFDM Program Systems Engineer

The Engineer Helicopter Flight Data Monitoring Program will be responsible for maintenance and upkeep of the system ware of the HFDM program. He/she reports to the Manager of the Flight Data Monitoring Program and is responsible for:

- Ensuring the proper functioning of GDRAS software, hardware, and associated peripherals, coordinating with vendors to troubleshoot and diagnose problems, and evaluating and implementing corrective actions,
- Managing physical computer resources and coordinating with ASL to repair faulty equipment,
- Coordinating with ASL to allow for improvements and updates for existing and future hardware and software,
- Interface with fellow members of the HMT to help apply changes in event monitoring software as needed,
- Assisting the HMT in reviewing and analyzing de-identified data,
- Coordinating with maintenance on airborne data systems, including parameter selection and validation,
- Using the FAS to troubleshoot and diagnose errors due to equipment and recording problems.

4.8 Gatekeeper

The HFDM Gatekeeper will have access to identifying data. The Gatekeeper shall be a currently qualified check airman or line pilot. The Gatekeeper will review suspected triggered events with the crews to determine the circumstances leading up to the event and then to help in modification of those factors so as to help prevent them in the future. The Gatekeeper is responsible for:

- Managing password selection and maintenance,
- Control access to identifying data, and
- Perform any necessary crew contacts.

Heli-Fact: Section 4 described the roles and responsibilities of personnel involved in the HFDM program in great detail. This may seem overwhelming to a small operator with limited personnel resources. Small operators may assign some of the tasks to existing employees (example: HFDM Program Engineer could be an avionics or maintenance technician or the Gatekeeper role could be filled my a check airmen or other qualified HFMT member) or outsource many of the tasks to third-party FDM service providers.

5.0 HFDM Program Implementation

5.1 Program Start Up Criteria

The start-up criteria for the program will be defined by the HMT and will include, but not be limited to:

- Completion of installation and testing of airborne equipment and GDRAS,
- Successful testing of the complete data analysis system,
- Validation of flight parameters,
- Validation of data collection system from the recording media to the GDRAS,
- Implementation of all data de-identification, protection, security, and retention procedures,
- Education of pilots and stakeholders,
- Training for HFDM program team members,
- Specification and validation of event and ROM definitions,
- Implementation of procedures to detect and analyze triggered events and ROM, and
- Implementation of procedures to identify and track corrective actions.

The decision regarding when the established criteria are met will be made by the HMT. Once the HMT determines a formal start date, any data collected before the formal start date must be re-analyzed prior to retention in the HFDM program database in order to assure that all reported events are valid.

5.2 Data Protection and Security

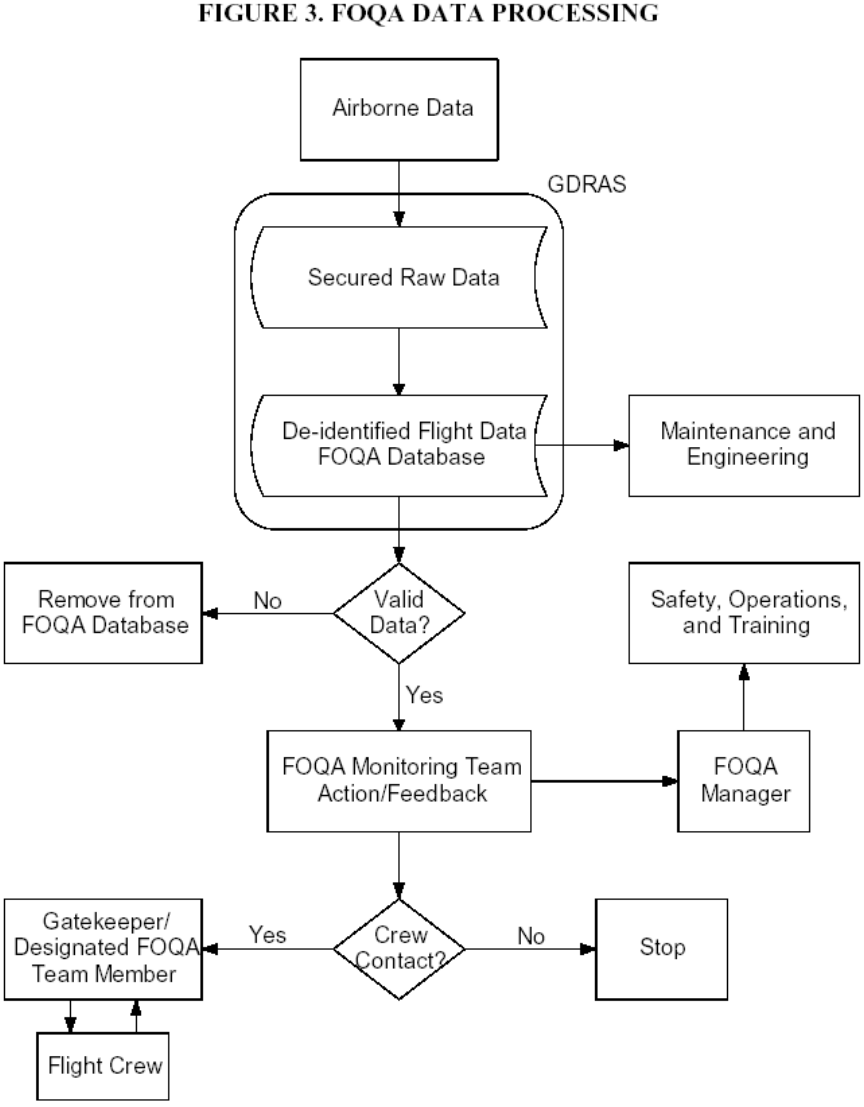
SAFEAir HFDM program provides protection and security for HFDM program data. HFDM program is designed to preserve flight crew anonymity and maintain the confidentiality of SAFEAir proprietary information. Therefore, the Aircraft numbers are removed from the secured raw data prior to any analysis of the HFDM program data.

Data access provisions will be implemented using capabilities provided by the GDRAS and verified by the HMT. The GDRAS must incorporate password-protected access to restricted data fields. The HFDM Program Analyst will review data security on a continuous basis. Procedures and policies for password selection and maintenance will be determined and managed by the HMT based on access level privileges. Provisions of the SAFEAir HFDM Program I&O Plan are concerned only with the data recorded on the equipment detailed in Section 3 of the plan. These provisions do not pertain to data residing in any mandatory crash survivable flight data recorder.

All GDRAS equipment and data retention will be maintained in a secure facility. Only authorized SAFEAir HFDM program personnel will have access to the GDRAS servers and data.

The flow of data through HFDM Program is illustrated in **Figure 3**.

Figure 3—HFDM Program Data Processing



5.3 Education and Training

A number of vehicles will be employed for pilot education including Quarterly Safety Meetings, HFDM Special Reports and a secure electronic bulletin board. The bulletin boards will highlight both HFDM program issues including featured events. An overview of the Monthly SAFEAir HFDM Reports will be posted on the company intranet.

Additionally each pilot will receive initial and recurrent training as to their duties and responsibilities concerning the on board ALERTS system as required by FAR 135.293, a, 8.

The HFDM program stakeholders will be provided with information about HFDM PROGRAM through reports generated from periodic HFDM program meetings, pilot bulletins, and a HFDM Program Overview report to be developed early in the effort.

All HFDM program personnel will receive training on the GDRAS software and animation software as appropriate to their tasks. Additionally, HFDM program team members will visit other carriers with established FOQA programs. Other training will be provided as new hardware and/or software is added to the program.

5.5 Data Analysis Procedures

5.5.1 Flight Data Collection and Analysis

Media logistic procedures will be established for air crewmembers to install and retrieve the SD cards from the ALERTS as part of their preflight and post-flight procedures. Procedures will be established for air crewmembers to retrieve data for evaluation from the Digital Flight Data Acquisition Unit to be installed in the cockpit of the Eurocopter AS-350 and Sikorsky S-76C+. This data will be subsequently uploaded to the GDRAS for analysis.

Once the system is in place and operation is verified SD cards will be installed and removed from aircraft at pre-determined SAFEAir maintenance locations by the air crewmembers. The data from the SD cards will be copied by the RDK and transferred to the SAFEAir Systems remote data center. The HFDM program office, through the secure company intranet system, will access the HFDM program data and perform analysis using the ASL EMS and ASL Flight Analysis System Software. Provisions for security and tracking of the media will be established through coordination with SAFEAir Operations, Maintenance and Engineering.

5.5.1.1 Missing Data

In the event that data is not received in the GDRAS from a particular aircraft whether by faulty or missing SD cards, a procedure will be designed to query the non-volatile memory of the installed ALERTS units to recover the missing data for subsequent analysis.

5.5.2 Event Classifications and Definitions

Measurements made in the SAFEAir initial HFDM program implementation will be classified into three levels. The first level is simply composed of parameter measurements that will be performed on every flight, and thus may include both ROM and Operational Exceedance Measurements (OEM) as defined in Appendix B. Level 1 measurement will be used to provide a statistical baseline to better understand the daily operation of the fleet. In addition, these measurements will provide a means to prepare timelines demonstrating the effectiveness of recommendations in improving fleet safety and efficiency. The second and third levels in HFDM program are subsets of the Level 1 events and will be composed only of those flight events, which are classified as "OEM"

OEM in the SAFEAir HFDM program implementation will be programmed into the GDRAS and reported at both Level 2 (for a minor deviation) and Level 3 (for significant deviation). The performance limits that define these event levels will be continually reviewed by the HMT to ensure they are consistent with the following SAFEAIR publications and guidance materials:

- Flight Operations Manual (FOM),
- SAFEAir flight training materials,
- Approved Rotorcraft Flight Manual (ARFM), and
- Manufacturer Maintenance Manuals.

The SAFEAir event set for the Eurocopter AS-350 is contained in Appendix B. These event sets will be modified as deemed appropriate by the HMT, and additional event sets will be defined as needed by HFDM program. The HFDM Program Analyst will be responsible for maintaining the event sets and coordinating with the HMT.

5.5.3 Event Definition Maintenance

The procedures for validating, reviewing, and refining event definitions will be established by the HMT and will ensure that event information is valid and reflects SAFEAir qualification and performance standards, training practices, and aircraft performance limits. All changes in the event definitions will be logged, and the records will be maintained by the HFDM Program Manager on the *Event Definition Maintenance*

Form (MSExcel and Google Docs). The event definition set will be reviewed at least annually by the HMT. All revisions and updates of HFDM program event definitions that are located in Appendix B shall be included in I & O plan revisions submitted to the FAA

5.5.4 Data Review and Evaluation

Flight event data and routine flight measurements will be processed by the HFDM Program Analyst to determine what occurred and whether the event was legitimate. A preliminary analysis will use GDRAS tools to interpret and visualize identified events and determine whether the event was valid or invalid because of bad data, a faulty sensor, or some other invalidating factor. Invalid events will be tagged for review by the HMT and will not be stored or used for trend analysis. In the event that the data reveal a situation of immediate concern to Maintenance and Engineering, the HFDM Program Analyst, will notify that organization. Preliminary analysis of the data to assess validity must be completed within seven business days from the time the data are received at the HFDM program facility. Subsequently, the data will be transformed into suitable report formats, both tabular and graphical, for analysis by the HMT. The HFDM Program Manager will continually evaluate and provide reports as to data quality, accuracy, and integrity standards.

All triggered event and ROM's will be evaluated by the HMT on a periodic basis as determined by the HFDM Program Manager. The HFDM Program Manager will maintain a log of the following:

- Types of triggered events or measurements;
- Specific actions taken or recommendations made by the HMT. Recommendations may include, but are not limited to, such areas as:
    - A need for increased emphasis on a specific training maneuver or procedure,
    - The issuance of an operations bulletin, or a change in an operational procedure in the FOM, and
    - Recommendations to outside agencies such as ATC Services,
- The appropriate parties (e.g., Maintenance and Engineering, Flight Operations, Flight Training, Flight Safety, etc.) notified about the recommendations; and
- The resolution of actions or recommendations resulting from triggered events.

The log will be used to generate a summary report for presentation to the HFDM Program Steering Committee and senior management. This log will be maintained in the HFDM program facility in a secure place. The HFDM Program Steering Committee will establish the retention period for this log.

5.5.5 Data Trending and Record Retention

De-identified flight data stored in the GDRAS will be periodically deleted as determined by the HFDM Program Steering Committee. Initially, full flight data will be retained for 24 months. Trend data will be maintained for a period of time as specified by the HMT in consultation with the HFDM Program Steering Committee. All record retention and de-identification procedures will be coordinated with SAFEAir record retention policies.

Reports that summarize event information and trends on various attributes (e.g., aircraft type, flight origin, destination, and month) will be prepared periodically for review and to determine the existence of any patterns. Trends will also be used to evaluate corrective actions and measure performance over time. Standard and trend analysis reports will be designed during the initialization phase. The reports will be designed for the specific needs of the HFDM Program Steering Committee, HMT, and stakeholders.

Heli-Fact: The reporting element of the HFDM program provides a tactical feedback mechanism to a Safety Management System (SMS). Additional information on SMS is available in the IHST SMS Toolkit (www.ihst.org). The SMS Toolkit goes into great detail identify risks to a flight operation. Risk assessment is based on the severity and frequency of an event – HFDM programs classify events based on severity, the reporting function identifies the frequency.

5.5.6 Dissemination of HFDM Program Information

The HMT will be responsible for generating reports summarizing the information obtained through HFDM program. The reports will include summaries of the most recent information obtained through HFDM program, as well as trend information to demonstrate the effectiveness of prior corrective actions. These reports will be distributed to Flight Training, Maintenance and Engineering, and other involved stakeholders on a regular basis. The HMT will solicit recommendations from the recipients of the reports in order to improve their usefulness as the program proceeds. Special reports highlighting a specific concern shall be published for flight crews on an

as needed basis. A basis for tracking disseminated HFDM program information so that a follow up can be made concerning suggested corrective actions.

5.6 Program Documentation and Maintenance

The HFDM Program Manager, will develop appropriate documentation for support of the HFDM program operation. This documentation, in addition to providing routine support of the process, will be used to facilitate any personnel transitions that may occur during the program.

5.7 FAA Access

The SAFEAir FAA POI and PMI shall be permitted free and open access to de-identified aggregate FOQA/HFDM data, including fleet-specific trend analysis information. This review will include a quarterly update of FOQA/HFDM trend information to SAFEAir FAA personnel. Any FOQA/HFDM data or information shared with the FAA shall be protected from use by the FAA for enforcement purposes in accordance with14 C.F.R. section 13.401 and shall be protected from public disclosure in accordance with part 193 and FAA Order 8000.81. Any de-identified FOQA/HFDM data or aggregate FOQA/HFDM data that leaves SAFEAir's property will be clearly labeled as follows: "WARNING: This FOQA/HFDM information is protected from disclosure under 49 U.S.C. 40123 and 14 CFR part 193. This information may be released only with the written permission of the Federal Aviation Administration Associate Administrator for Regulation and Certification." Airline identity and other information that could be employed to derive airline identity will be removed from any FOQA/HFDM aggregate data submissions, which SAFEAir provides to the FAA in compliance with section 13.401, unless SAFEAir elects to include that information. In the event that SAFEAir chooses to allow FOQA/HFDM data or aggregate FOQA data that includes airline identity information to be removed from SAFEAir property, all such data will be labeled as the confidential and proprietary property of SAFEAir, in addition to the preceding warning.

In accordance with the FOQA Aviation Rulemaking Committee (ARC) recommendations that have been accepted by the FAA, SAFEAir will participate in industry information sharing activities for FAA-approved FOQA programs. All information included in any industry sharing activity or any request for information will be reviewed and approved by SAFEAir before release by SAFEAir. The information released will be considered SAFEAir proprietary information and will be de-identified so that specific flight information is not included. To the extent possible, the information released will be de-identified to limit the references that identify it as SAFEAir information. In addition, at

such time as the FAA provides guidance regarding future requirements for compliance with part 13, section 13.401(d), SAFEAir will review those requirements to determine whether to continue its voluntary participation in an approved FOQA program. If the decision is made to continue with the program, then, this I&O Plan will be revised accordingly.

5.8 I & O Plan Maintenance

A revision control methodology and distribution list will be established for the I & O Plan. A revision control page, which identifies the pages to be added, removed, and/or replaced, will be submitted with any revisions. Each revised page will indicate the page number and date. Revisions to the I & O Plan will be provided as necessary and appropriate. All revisions to the I& 0, including event definitions, will be submitted to SAFEAir FAA POI and to FAA AFS-230. Due to the large number of changes that may be made during the initial stages of HFDM program, approval for quarterly submission of I & O Plan changes will be sought from the POI.

HFDM Program I & O Submitted by:

_____

Sky Van Safer

Director of Operations

SAFEAir

6.0 Appendix A

INSERT HFDM PILOT AGREEMENT

8.0 Appendix B

SAFEAir HFDM PROGRAM Measurements (Aircraft Type Eurocopter AS-350)

INSERT EVENT SET

9.0 Appendix C

Glossary

Air Carrier	An organization that undertakes -- either directly by lease or some other arrangement -- to engage in air transportation.
ALERTS	Aircraft Logging Event Recorder for Training Standardization. An assembly installed in SAFEAir aircraft consisting of a GAU 2000, a RMS 2000 and a GPS antenna to facilitate gathering events to be analyzed for SAFEAir HFDM PROGRAM.
Analyst	The HFDM PROGRAM team member who is primarily responsible for the security of identified data. The Analyst is the only individual who can link HFDM PROGRAM data to an individual flight or crewmember.
Approach	Flight phase denoting period form top of descent until 50 feet radio height or the initiation of landing flare.
ARINC	Aeronautical Radio Incorporated. The ARINC organization is the technical, publishing and administrative support arm of the Airlines Electronic Engineering Committee (AEEC) groups. AEEC standards define avionics form, fit, function, and interfaces.
ASL	APPAREO Systems LLC. The Manufacturer of the ALERTS system installed in SAFEAir aircraft. Designer of EMS and FAS software used to evaluate data in the GDRAS of the SAFEAir HFDM PROGRAM.
ATC	Air Traffic Control. A service operated by appropriate authority to promote the safe, orderly, and expeditious flow of air traffic.
AVI	Audio Video Interleaved. A Windows multimedia video format from Microsoft. It interleaves standard waveform audio and digital video frames (bitmaps) to provide reduced animation at 15 fps at 160x120x8 resolution. Audio is 11,025Hz, 8-bit samples.
Certificate Holder	The holder of an operating certificate and operations specifications that authorize Part 121 or Part 135 operations. May also refer to an individual holding an airman certificate.
Climb	Flight phase denoting time period following takeoff from 35 feet radio altitude until level off in cruise flight.
COTS	Commercial Off The Shelf. Products, components or software that is readily available through normal commercial channels, as opposed to custom-built units that would achieve the same functionality.
Cruise	Flight phase denoting the period between top of climb and top of descent or the enroute time of flight.

De-identified Data	Data from which any identifying information that could be used to associate the data with a particular flight, date, or flight crew has been removed.
DemoProj	A demonstration project sponsored by the FAA for the purpose of establishing FOQA programs in the United States, permitting both government and industry to develop hands-on experience with FOQA technology in a U.S. environment, documenting the cost-benefits of voluntary implementation, and initiating the development of organizational strategies for FOQA information management and use.
DFDAU	Digital Flight Data Acquisition Unit. A device that acquires aircraft data via a digital data bus and analog inputs, and formats that information for output to the flight data recorder in accordance with requirements of regulatory agencies. In addition to the mandatory function, many DFDAUs have a second processor and memory module that enables them to perform a limited number of ACMS functions/reports. The DFDAU can provide data and pre-defined reports to the cockpit printer, or a display for the flight crew, or directly to ACARS for transmittal to a ground station, or to a QAR for recording/storage of raw flight data.
DFDMU	Digital Flight Data Management Unit. A unit that performs the same data conversion functions as the DFDAU and has the added capability to process data onboard the aircraft. Some DFDMUs have ground data link and ground collision avoidance systems incorporated into the units.
DFDR	Digital Flight Data Recorder. A device that records pertinent parameters and technical information about a flight. At a minimum, it records those parameters required by the governing regulatory agency, but may record a much higher number of parameters. A DFDR is designed to withstand the forces of a crash so that its information may be used to reconstruct the circumstances leading up to the accident.
DFDMU	Digital Flight Data Management Unit.
EMS	Event Management System. A component of the ASL GDRAS server designed by ASL for the evaluation, and reporting of data gathered from ALERTS for SAFEAIR HFDM PROGRAM.
Event	An occurrence or condition in which pre-determined limits of aircraft parameters have been exceeded. An event may be categorized according to the degree to which its pre-determined limits were exceeded. Definition of an event may be limited by monitoring equipment capabilities and available parameters on a given aircraft. Events are tracked for use in FADAP analysis.

Event Set	A group of events designed to monitor one or more aspects of air carrier line operations. An event set is created for a specific aircraft type and tailored to the operational and regulatory needs of the air carrier (designated as a Profile within the SAFEAir HFDM PROGRAM system).
FAA	Federal Aviation Administration. The agency under the Department of Transportation tasked with the regulation and promotion of air commerce.
FAS	Flight Analysis System. An APPAREO product that allows visualization and analysis of ALERTS data in graphical and printed form.
FAR	Federal Aviation Regulations. Federal rules that govern airworthiness and the conduct of flight operations by certificate holders.
FDAU	Flight data acquisition unit. See DFDAU.
FDR	Flight data recorder; required recording equipment designed for post-crash analysis. See DFDR.
FDS	Flight Data Storage. Component of ASL GDRAS used to store HFDM PROGRAM data.
FOM	Flight Operations Manual. A SAFEAir publication that outlines policies and procedures for SAFEAir pilots and operations.
FOQA	Flight Operational Quality Assurance. FOQA is a program for the routine collection and analysis of flight operational data to provide more information about, and greater insight into, the total flight operations environment. A FOQA program combines these data with other sources and operational experience to develop objective information to enhance training effectiveness, operational procedures, maintenance and engineering procedures, and air traffic control procedures.
GAU 2000	Geospatial Awareness Unit. A subsystem of the ASL ALERTS system designed to recreate flight regimes of installed aircraft.
GDRAS	Ground Data Replay and Analysis System. A software application designed to: transform airborne recorded data into a usable form for analysis; process and scan selected flight data parameters; compare recorded or calculated values to predetermined norms using event algorithms; and generate exceedence reports for review or trending when exceedances are found.
HMT	HFDM PROGRAM Monitoring Team. A group comprised of representatives from the pilot group and the air carrier. This group, sometimes referred to as the exceedance Guidance Team (EGT) or Event Monitoring Team (EMT), is responsible for reviewing and analyzing flight and event data, and determining and monitoring corrective actions.

HFDM PROGRAM	Helicopter Flight Data Monitoring Program. FOQA like program specifically used by SAFEAir.
I&O Plan	Implementation and Operations Plan. A detailed specification of key aspects of a FOQA program to be implemented by an air carrier. An I&O Plan describes the operator's plan for collecting and analyzing data, procedures for taking corrective actions that analysis of the data indicate are necessary in the interest of safety. It also includes; procedures for providing the FAA access at the air carrier's offices to de-identified aggregate FOQA information, and procedures for informing the FAA about any corrective actions being undertaken.
Identified Data	Flight data that is in a format such that the identifying flight number and date are associated with it. This flight data can be associated with a specific flight and operating crew.
LAN	Local Area Network. A communications network that serves users within a confined geographical area, typically linked together by cable.
Landing	Phase of flight denoted by time period following the climb phase from 50 feet radio altitude until exit from the landing runway.
LOA	Letter of Agreement
LRU	Line Replaceable Unit. A unit that can be replaced by line maintenance personnel without removing the aircraft from service for an extended period.
MEL	Minimum Equipment List. A list of required equipment that, under certain conditions, may be inoperative.
Mirrored Sever	A “mirrored” server is identical to the primary server. Data are written to both servers simultaneously, providing a very high level of data redundancy. The mirrored server may also act as a Backup Domain Controller, taking over for the Primary Domain Controller if it is not available.
MTBF	Mean Time Between Failures. The life expectancy of a component or part expressed in flight hours.
OQAR	Optical Quick Access Recorder. See QAR. A QAR that stores data on an optical disk.
OEM	Operational Exceedance Measurements. Measurements of flight data that relate to exceedances or deviations from expected operations.
PAI	Principal Avionics Inspector. The FAA employee responsible for oversight and inspection of avionics at a specific air carrier.
Parameters	Measured sensory data.

PCMCIA card	Personal Computer Memory Card International Association card. A credit card-sized data storage and transfer device that was originally developed for portable computers and may be used on some QARs. The Personal Computer Memory Card International Association was organized in 1989 to promote standards for these memory or input/output (I/O) devices.
PMI	Principal Maintenance Inspector. The FAA employee responsible for oversight and inspection of aircraft maintenance functions at a specific air carrier.
POI	Principal Operations Inspector. The FAA employee responsible for operational oversight of a specific air carrier.
PPM	Partial Program Manager. An FAA inspector position responsible for some aspect of the operator's maintenance program under the direction of the FAA PMI.
Profile	A group of events designed to monitor one or more aspects of air carrier line operations. A profile is created for a specific aircraft type and tailored to the operational and regulatory needs of the air carrier. (Event Set) in the ASL EMS software.
QAR	Quick Access Recorder. A recording unit onboard the aircraft that stores flight-recorded data. These units are designed to provide quick and easy access to a removable medium, such as an optical disk or PCMCIA card, on which flight information is recorded. QARs have now been developed to record an expanded data frame, sometimes supporting 2000+ parameters at much higher sample rates than the FDR. The expanded data frame greatly increases the resolution and accuracy of the ground analysis programs.
RDBMS	Relational Data Base Management System. A database organization method that links files together as required. In non-relational systems (hierarchical, network), records in one file contain embedded pointers to the locations of records in another.
RDK	Remote Data Kiosk. An ASL product that allows for remote acquisition and transmission of flight data.
RMS 2000	Sub system component of the ASL ALERTS system used to collect and store data for analysis. Performs a similar task to a quick access recorder (QAR)
ROM	Routine Operational Measurements. The measurement of events or maneuvers that occur or are expected occur on every flight; e.g. pitch attitude at main gear lift off during takeoff.

SD Card	Secure Digital Card is a flash memory card format. Standard SD cards measure 32 mm by 24 mm by 2.1 mm. An IBM PC compatible data storage device used with the RMS 2000 to store and transfer secured raw data through the RDK for SAFEAir HFDM PROGRAM.
Secured Raw Data	Flight data that exists in its primary binary form with security provisions attached to the data to prevent unauthorized personnel access to the data.
SRU	Shop Replaceable Unit. A unit that must normally be replaced in a maintenance facility during heavy maintenance checks.
SSFDR	Solid State DFDR. A DFDR that utilizes solid-state memory for recording flight data. See DFDR.
STC	Supplemental Type Certificate. An addendum to the Type Certificate. An STC is required for any new equipment installed on a model of aircraft after that model of airplane has been issued a Type Certificate. See TC.
Takeoff	Phase of flight denoted by time period from initial liftoff to a hover and departure until 50 foot of altitude above the ground.
Taxi	Phase of flight denoted by time period during ground operation prior to takeoff and after landing
TC	Type Certificate. The initial certificate issued for every new model of aircraft. The TC lists components and equipment installed on that model of aircraft.
WAN	Wide Area Network. A communications network in which computers are connected to each other over a long distance, using telephone lines, cable connections, or satellite links.
WDL	Wireless Data Link. A system allowing the high-speed transfer of on-board aircraft data to ground facilities using various wireless technologies. It may also allow for upload of data to the aircraft. Sometimes referred to as Ground Data Link (GDL).

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