FIAPA in the Cockpit

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BIOGRAPHIES

Gary Bell is a retired United States Air Force officer. He has over 5,000 flight hours and is type rated in several civilian aircraft including LJ60 and BE300 aircraft. He is a graduate of the University of Oklahoma Price School of Business and Embry-Riddle Aeronautical University. Gary was employed by the FAA as a Safety Study Flight Test Director before transferring to Flight Inspection Team in 2012. He has worked in the Aircraft Configuration Team of FIT as a Company Test Pilot since that time and is a graduate of FAA Flight Test Pilot/Engineer Initial Qualification course administered by The National Test Pilot School.

Greg Cox is a flight inspection pilot with over 6,000 hours in multiple aircraft including the FAA Lear and Challenger series aircraft. He is a graduate of Oklahoma State University with Bachelor's and Master's degrees in Electrical Engineering. Greg has worked for Sandia National Laboratories, the United States Air Force (USAF), United Airlines, FAA Aviation Flight Standards, and for the last 4 years, the FAA Flight Program. He currently works as a USAF Reserve T-38 Instructor Pilot and as a pilot within the FAA's Aircraft Configuration Team responsible for flight inspection aircraft readiness, establishing requirements for system modifications, and all testing required for Operational Approval of new inspection systems.

ABSTRACT

This paper discusses the training program developed to train pilots in the Flight Inspection Airborne Processor Application (FIAPA). This training involved an understanding of the system, components of the system, system operation, differences from the previous flight inspection system, techniques for system use, risks associated with this system and mitigations for those risks. In addition to being a step in the evolution of flight inspection data collection and analysis, FIAPA provides benefits in the safe and efficient execution of flight inspection. FIAPA can increase crew interaction, decrease extraneous verbal communication and save time, fuel and money by making the flight path of each flight inspection mission more efficient. The FAA conducted pilot training in both ground and flight modules. Ground training included lecture and an activity lab using a simulator. Flight training was conducted via either a flight inspection itinerary over several days, or a dedicated training flight of approximately 4 hours. Training was generally well received and all objectives were met. Training methodology was validated and supported the continued deployment plan of the NAFIS Phase II system.

INTRODUCTION

The Federal Aviation Administration is transitioning to a new Flight Inspection System. This program is called Next-Generation Automated Flight Inspection System (NAFIS). NAFIS is a 2- phase project that uses state of the art technology to satisfy current and future customer and flight inspection requirements, adds value to the NAS and meets the goals and objectives of the Next-Generation Air Transportation System (NextGen). NAFIS Phase II consists of both hardware and software changes. The hardware component is the Data Collector/Correlator (DCC). The DCC is used to collect and time-tag the aircraft sensor data. This data can be evaluated during both real-time and review inspection modes available in NAFIS Phase II. The software component is the FIAPA program. FIAPA utilizes multithreading technology in order to create a responsive graphical user interface (GUI) and to ensure the availability of processor time for the analysis and collection of real-time flight inspection data. This GUI is designed to be more user friendly and intuitive than previous FIS interface programs. In addition to collecting facility data and providing results of Real Time inspections, re-calculation of previously collected inspection data (Re-Run) and displaying the results of previously analyzed inspections data (Replay), the GUI continuously monitors system diagnostics and provides notification of out of tolerance conditions during Real-Time and Re-Run mode inspection passes. In addition to the flight inspection aircraft, FIAPA provides utility in the office on a desktop computer, or in the field on a laptop computer. FIAPA is an advanced DO-178B proprietary software program. Since the crew interacts with the FIAPA program and is not directly affected by the presence or absence of the DCC, the training crews refer to the system simply as "FIAPA". That term will be used through the remainder of this paper to describe NAFIS Phase II.

SYSTEM DESCRIPTION

The FIAPA system displays inspection data in three ways: Raw data logging, Re-Run mode, and Replay mode. When collecting raw inspection data, FIAPA collects and processes data from the flight inspection aircraft's sensors. Processed inspection results are immediately available. FIAPA logs this real-time data into a raw log file. Using this raw log data, the Re-Run Mode allows the operator the option to alter the inspection settings, and then process the raw logged data as if the aircraft had flown another inspection pass. The Re-Run mode re-calculates inspection results. The Replay Mode allows the operator to view the results of a previous inspection. The data used in the Replay mode is the results data from the flight inspection mode used to perform analysis during Real-Time or Re-Run operation. Replay Mode does not re-calculate previously collected data. It simply provides visibility of the results of a previous inspection pass.

The FIAPA presentation is on two full sized monitors. While functionally identical, the monitor configuration differs between the Canadair Challenger fleet and the Beechcraft King Air 300 (BE300) fleet. The BE300 configuration is side by side monitors. The Challenger configuration is top and bottom. The BE300 left monitor is the Challenger top monitor.

Fig 1. NAFIS Phase II Monitors (BE300 Configuration)

The left monitor contains three tabs: the Control Tab, the Results Tab and the Situational Tab. The Control Tab is where modes are selected and the Run Button is located. The Results Tab is the colloquial name given to a tab that has 5 sub-tabs: Facility, Setup, Results, Summary and Diagnostics sub-tabs. The Facility Tab is the first tab to open after selecting ILS, Rho-Theta, RNAV or Radar mode for facility type. This tab allows the operator to select, add or modify facility data for flight inspection and to verify the information if there are differences between the FIAPA database and the AIRNAV data sheet. The Setup Tab allows the operator to configure the application for different types of flight inspections profiles, the selection of positioning reference system (PRS) to be used during the inspection and, if it is applicable, the configuration of the flight inspection receivers. The Results Tab provides more "in-depth" information about the inspection than the summary Tab or the History mode. During the Inspection or Rerun modes, the results Tab will give information as the run progresses versus the summary tab or History mode that will only be available after the run. The Summary Tab shows the summary results of the current run or reruns. Only the active run information can be obtained on the Summary Tab and it cannot display any runs from other facilities. The Summary Tab and the History Mode are very similar. The Diagnostics Tab shows the last test status for each LRU. Each LRU can be selected separately and tested using self-test. So, each can have its own completion UTC and test status. For replay / rerun, it will show the status of self-test when the real-time run was performed. The Situational Awareness Tab (SA Tab) provides a non-navigable display of the position of the aircraft relative to the facility being inspected as well as the type of inspection selected through the Setup sub-tab. The SA Tab is divided in two sections: The Graphical Data Information and the Textual Data Information.
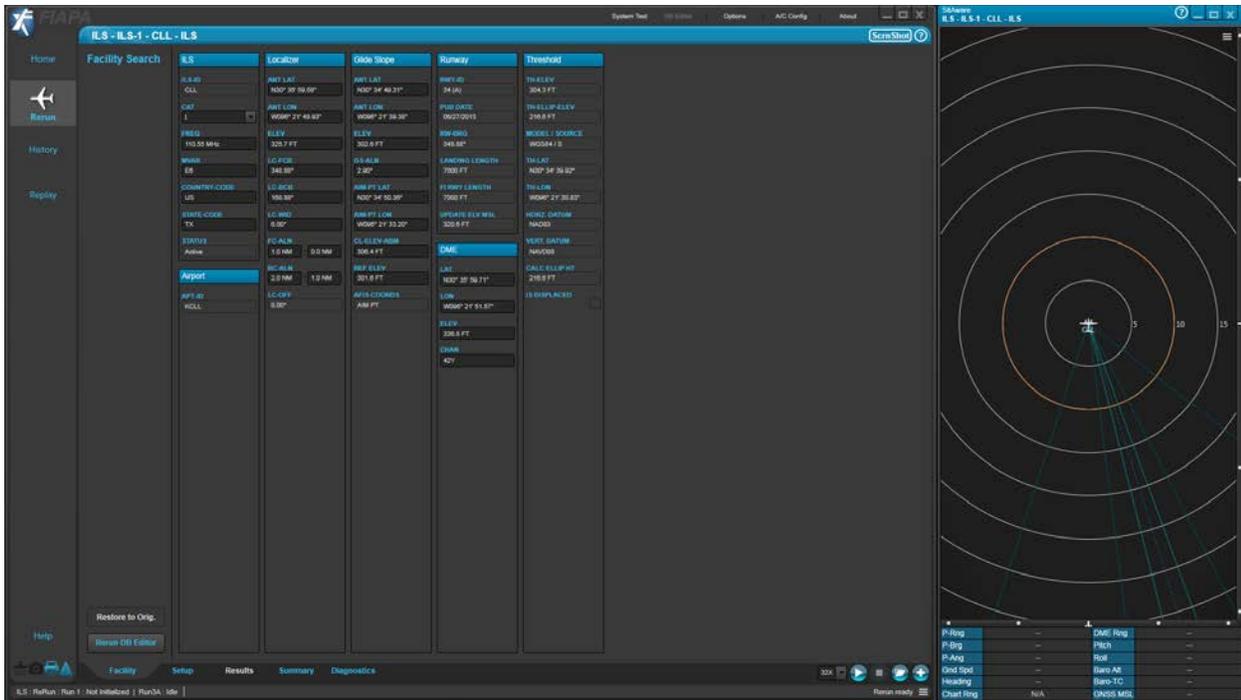
Fig 2. Left Monitor (BE300)

The right monitor contains two tabs: the Chart Tab and the Monitor Tab. The Chart Tab provides a graphical representation of the signals collected by the flight inspection receivers and other supportive inputs that are relevant for a given inspection mode. This Tab allows the operator to visualize a large set of data in up to six bands, typically used to group related traces, with each band supporting up to four traces at a time. Individual bands can be dynamically hidden/unhidden or maximized/restored. Traces can be dynamically removed from or added to a band, moved to another band, or replaced by another trace. This allows the chart layout to be customized, which can then be saved to the operator's mobile drive. The traces can be individually scaled, moved, and hidden/unhidden within the band. A set of chart tools aid in manual analysis and allow for annotating the chart. The menu arrangement for the trace control changes with the flight inspection mode in use. The Monitor Tab displays raw information coming directly out of the DCC. The calculated data available in the monitor tab is processed data, not displayed in real time. There is an inherent delay in retrieving the data from the DCC. This delay is typically 0.5 seconds, but could be up to 2 seconds in some instances.
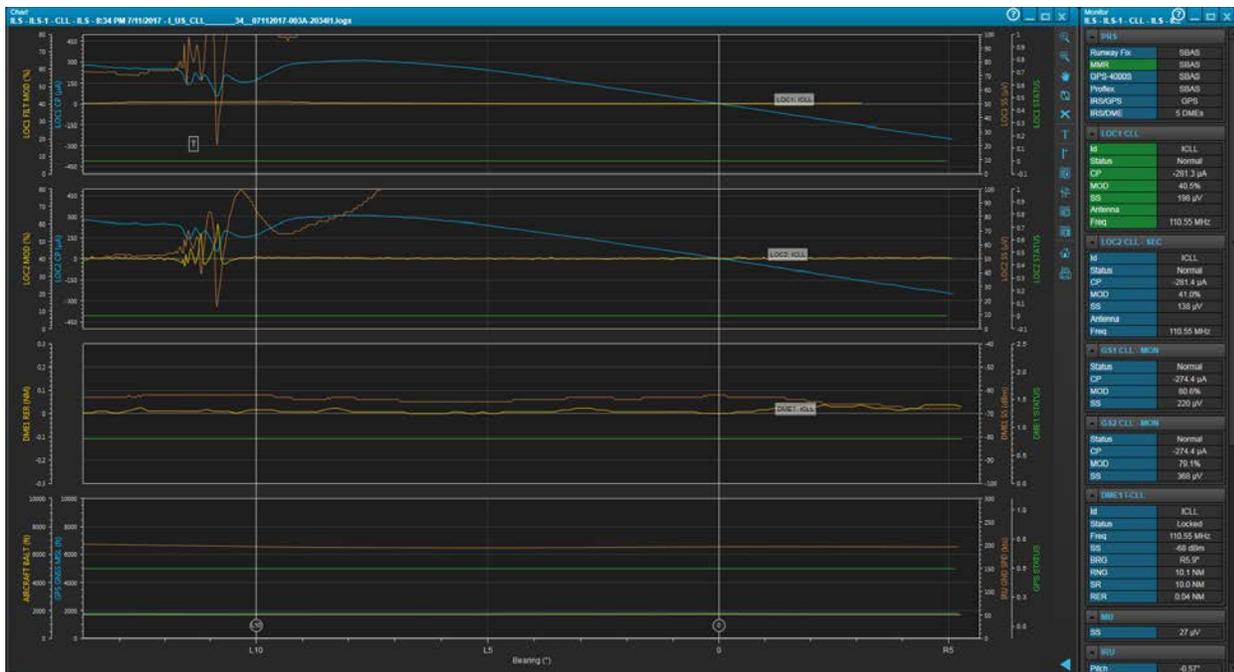
Fig. 3. Right Monitor (BE300)

CABIN WIFI

While this has been a paradigm shift in operating procedures for the Mission Specialist, the pilots' normal procedures have changed as well. Congruent to the installation of NAFIS Phase II with FIAPA, the Flight Inspection Team (FIT) has also installed Cabin WiFi. This capability allows the pilots to view the FIAPA work screens with Virtual Network Computing technology (VNC). VNC is a graphical desktop sharing system. It transmits the monitor images from one computer to another. In our application, VNC allows the pilots to see the Mission Specialists workstation in real time. The pilot interface is a small tablet computer (iPad Pro or Mini) mounted in view of the pilots. This device also functions as the electronic flight bag (EFB) interface. This capability is not tied directly to FIAPA. If installed on the aircraft, it is available for use with NAFIS Phase I. However, the FIAPA GUI is superior to that of the NAFIS Phase I interface. When combined with the VNC viewer, the FIAPA interface produces increased efficiencies in flight inspection execution.

The VNC capability, combined with the enormous leap in functionality provided by FIAPA, provides the pilot substantially more information concerning the ongoing, or previous, flight inspection data collection passes and data analysis. We have found that this combination can significantly increase the efficiency of the flight inspection by leveraging the combined awareness of pilot and Mission Specialist during the ongoing data collection pass to improve the shared mental model of the tasks at hand. By providing a common visual reference, it also reduces verbal communication requirements. It can also greatly enhance the efficiency of the aircraft flight path during a series of inspection runs by providing the pilot direct access to the current relationship between facility and sensor. The GUI, designed for the Mission Specialist not the pilot, does not provide information in a format designed for navigation. The VNC provided replication of the display on the iPad will usefully display no more than approximately one sixth of the working display in normal size. In order to maximize the usefulness of the information available, the pilots must be familiar with the FIAPA GUI.
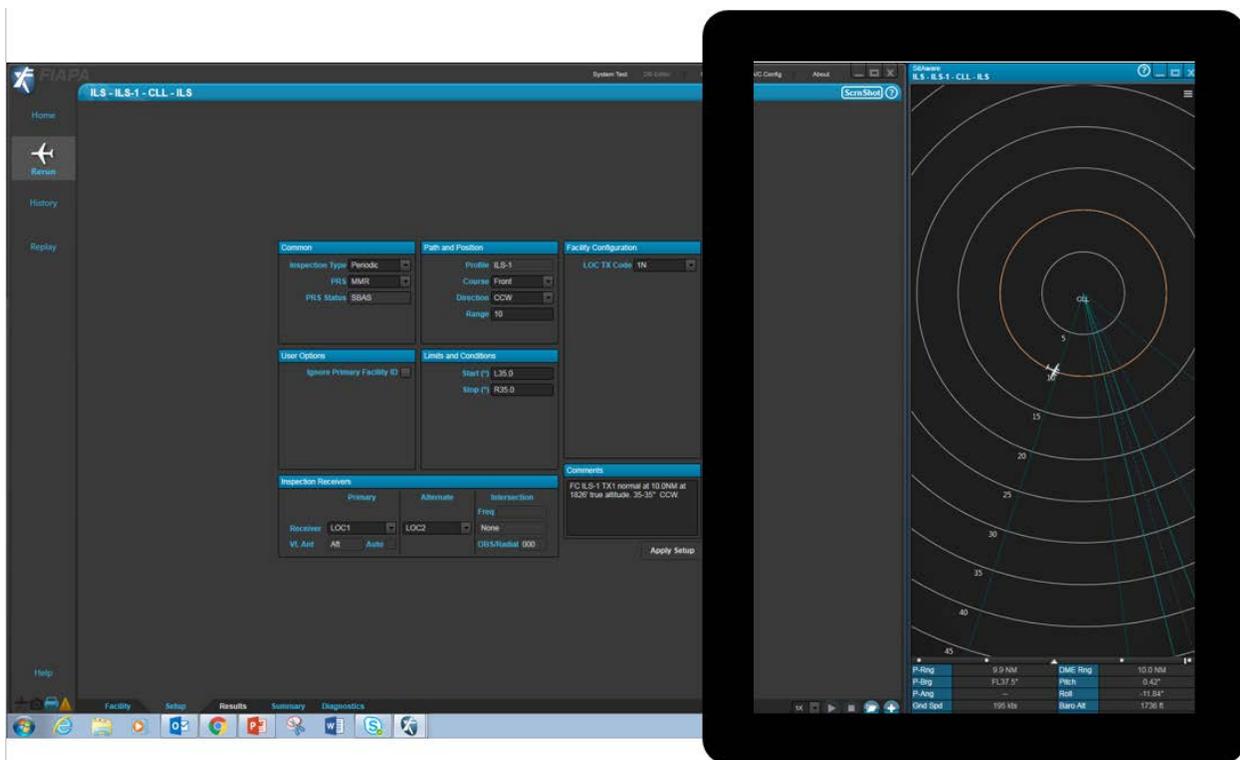
Fig 4. VNC View Approximation

TRAINING PROGRAM

FIAPA is an evolutionary change in flight inspection capability and a monumental change in Mission Specialist operation. However, the pilot has new responsibilities and capabilities as well. Due in large part to the addition of the VNC capability, the pilot now has access to the Mission Specialist displays. This leads to greater capability, but also to exposure to new hazards. This describes the development of a pilot training program to exploit the capabilities and mitigate the risks. See Appendix 1.

The objective of the pilot training was to produce a pilot able to safely and effectively support flight inspection using a FIAPA configured aircraft. To that end, the pilot must:

- Understand NAFIS Phase II vs. NAFIS Phase I component differences;
- Know FIAPA operating procedures;
- Know FIAPA terms and labels;
- Know how to conduct and report RNAV inspections;
- Be able to monitor the progress of the inspection using the VNC application on the iPad.

Training was developed in conjunction with developmental testing. Our training program emphasized the various information available and how best to access that information through the VNC application. Initially only those pilots involved with developmental testing were exposed to the capabilities provided by FIAPA. As developmental testing drew to a close, additional pilots, selected to be initial cadre instructors, were introduced to the VNC/iPad FIAPA information. This group then became the instructors when formal training commenced. The training program consisted of ground training of approximately 7 hours, and flight training consisting of a (typically) 4-day inspection itinerary in a FIAPA configured aircraft, or a single training flight in which the pilot training was the sole training event.

The ground training was broken down into the following topics:

- Current issues with flight inspection of RNAV(GPS) and RNAV(RNP) Approaches
- NAFIS Phase II vs. NAFIS Phase I component differences

- New terms associated with FIAPA and available position reference sources (PRSs)
- Operationally Approved FIAPA modes and sub-modes
  - This topic includes use of how FIAPA during preflight preparation, flight inspection, and post mission.
- Differences in maneuvers/runs when using NAFIS Phase II to conduct flight inspection
  - FI Low Approaches for most RNAV(GPS) and RNAV(RNP) Approaches
  - ASR/PAR distance and coverage runs
  - PAR/VGSI coverage runs
- Single fix TVPS/Pilot update and different PRSs
- How to view inspection data in FIAPA on their iPad using WiFi/VNC screen sharing.

RNAV training was conducted concurrent with the FIAPA training block. Though this training addressed differences when using NAFIS Phase II configurations to conduct RNAV inspection, this training is beyond the scope of this paper.

Knowing the differences between NAFIS Phase II and NAFIS Phase I components and knowing the terms used to describe these components and discuss NAFIS Phase II operations is a key piece of this training. While the pilot will typically not have a direct interaction with either the hardware or software, effective communication with the Mission Specialist is dependent on a common understanding. Effective communication cannot occur when the parties either do not have the same breadth of understanding, or do not share the same lexicon. This became apparent early in the development of the training program. The communication between pilot and Mission Specialist is almost exclusively verbal. The pilot is looking at the Mission Specialists workstation. In order to navigate the workstation and to discuss information on the workstation, the pilot must understand the jargon the Mission Specialist is using to define his workspace. In order to go quickly from "hey pilot, look at this" to "I see it" requires agreeing on correct labels and terminology. The pilot is able to view the MS workstation monitors, but not interact with them. The pilot is unable even to control a mouse cursor or pointer. Terminologies new to FIAPA are the various Position Reference Sources (PRS), blocks and fields within modes and sub-modes.

An efficiency of the system is that the pilot can follow the MS during set up for the next facility and for the next inspection run. The pilot must understand the modes and sub-modes and how the MS will use them for setup, inspection and analysis in order to keep up. As the pilot gains proficiency in anticipating the MS work flow, he is able to confirm facility, inspection mode, run type and direction without interrupting either the MS workflow or coordination of the aircraft with controlling agencies. This non-verbal communication allows the pilot to confirm the MS is setting up properly for the next run, that they agree on the next run and that the setup is correctly loaded in FIAPA. Perhaps more importantly, as the pilot becomes adept at finding the pertinent information, he is able to conduct this non-verbal communication and set-up check without compromising his pilot duties, such as: traffic and obstacle deconfliction, coordination with ATC, aircraft systems monitoring and planning for follow on inspection runs or aircraft recovery. The reduction in verbal communication does not mean less communication or a reduction in CRM. FIAPA allows typical verbal communication to be conducted non-verbally. This can be a tremendous time saver and safety enhancement, especially when working high traffic and communication dense facilities. However, the addition of Re-Play can cause confusion to even a FIAPA competent pilot. The Re-Play function can be used in flight, re-playing the previous run, or a run that was conducted on any previous itinerary, assuming the MS has the data stored. This gives the same indication of the system beginning recording as a raw data inspection run. In this case, the non-verbal confirmation that the MS is ready for and has begun recording the *current* run is misleading. The green bar will then indicate the Re-Play has started, not the raw data collection.

Though most differences are minor changes, or changes that will not break the system if forgotten, there are differences in how NAFIS Phase I and II operate. Obviously, the MS workstation presentation, the GUI, is very different. However, the pilot was not able to view the NAFIS Phase I work station since the Cabin WiFi modification was concurrent with NAFIS Phase II. In the aircraft, differences begin with WiFi configuration. The WiFi must be enabled and the iPad must be set up for viewing. During the first self-test of the itinerary, both pilot input buttons must be checked in coordination with the MS's conduct of the test. More important, perhaps, is that FIAPA only requires Event Marks to indicate the edges of coverage for PAR and VGSI as opposed to a centerline as well. Additionally, changes in the RNAV inspection dictate a runway update be conducted on each RNAV SIAP inspection run. However, the greatest chance of a blown run due to improper pilot operations is during PAR inspections. On a PAR inspection, the EVENT MARK button, accessible only by the pilots, is the only means of inputting range data, and FIAPA assumes the Event Mark indicates miles, to the whole mile.

New to FIAPA is the ability to use the Single Fix TVPS/Pilot Update capability to conduct a runway update by overflying only the threshold rather than threshold and departure end. This sub-mode is not intended to replace the normal full length runway update but to provide for instances where a full length low approach is unsafe. Also new is the term PRS, indicating the various

Position Reference Systems. While conceptually, this is not a change from NAFIS Phase I, or even the legacy NXT FIS, the pilot is now able to see which PRS is active. When adept, he becomes a check of proper system setup.

In order to take advantage of the efficiencies of FIAPA, the pilot must be able to view and manipulate the VNC image on his iPad. While critical, this is nothing more than a straightforward process of loading, configuring and accessing the Cabin WiFi signal on the VNC viewer application.

GROUND TRAINING

The ground training program consists of 7 hours of classroom instruction. 4 hours of the instruction is lecture. Three hours is spent in a training lab with a FIAPA simulator. This simulation uses the Re-Play mode and VNC. This feature of FIAPA allows the student to interact with the MS workstation (as well as an instructor MS) through the VNC application with a very high fidelity to the interaction seen during a raw data collection flight. As addressed earlier, the RNAV instruction was a review of RNAV procedures as well as differences in RNAV inspection using FIAPA. RNAV inspection is beyond the scope of this paper.

The FIAPA lecture instruction covered the objectives detailed earlier. The objectives were covered concurrently using graphics slides and lecture to cover terminology, NAFIS Phase II components and risk mitigation. This lecture began by illustrating the geography of the FIAPA workstation by showing both monitors. Each tab or sub tab was then introduced by location on its respective monitor. Each tab was discussed in detail with the emphasis on information available, various modes of the tab, and when the MS would likely be referencing or changing the tab being discussed. A high priority objective addressed during this lecture was the understanding and use of proper terminology.
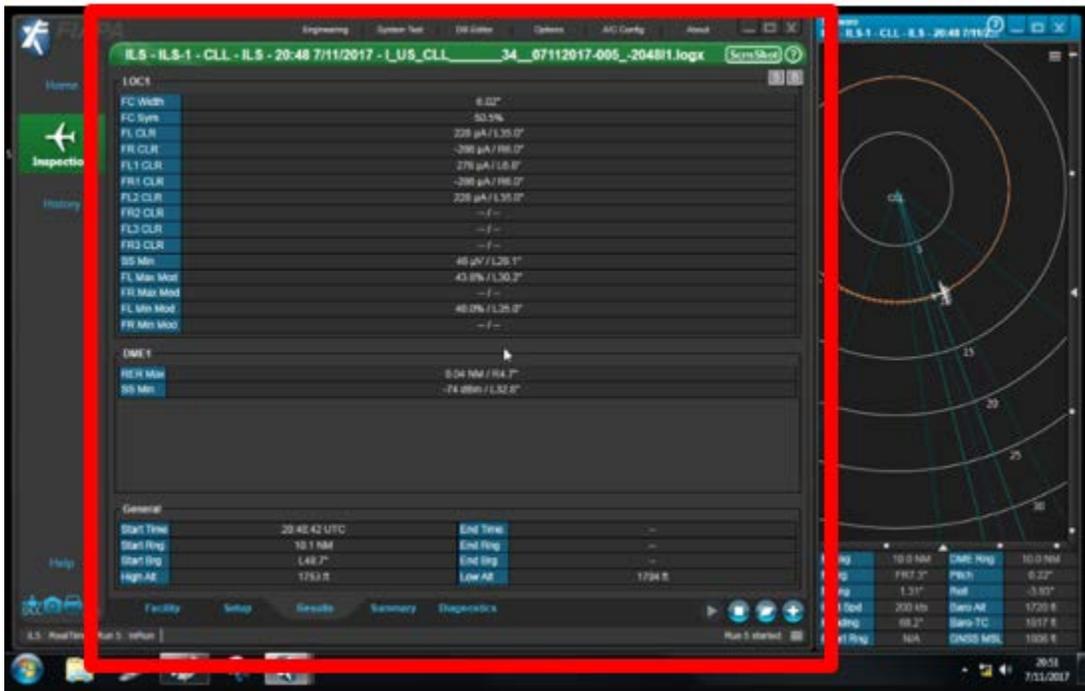

Fig 5. Results Tab on Left Monitor (BE300)

ILS - ILS-1 - CLL - ILS - I_US_CLL_____34__07112017-003_-2034I1.logx   ScrnShot ?

ILS

ILS-ID
CLL

CAT
I

FREQ
110.55 MHz

MVAR
E8

COUNTRY-CODE
US

STATE-CODE
TX

STATUS
Active

Airport

APT-ID
KCLL

Localizer

ANT LAT
N30° 35' 59.58"

ANT LON
W096° 21' 48.93"

ELEV
325.7 FT

LC-FCB
348.88°

LC-BCB
168.88°

LC-WID
6.00°

FC-ALN
1.0 NM   0.0 NM

BC-ALN
2.0 NM   1.0 NM

LC-OFF
0.00°

Glide Slope

ANT LAT
N30° 34' 49.31"

ANT LON
W096° 21' 39.38"

ELEV
302.6 FT

GS-ALN
2.90°

AIM-PT LAT
N30° 34' 50.36"

AIM-PT LON
W096° 21' 33.20"

CL-ELEV-ABM
306.4 FT

REF ELEV
301.6 FT

AFIS-COORDS
AIM PT

Runway

RWY-ID
34 (A)

PUB DATE
06/27/2013

RW-BRG
348.88°

LANDING LENGTH
7000 FT

FI RWY LENGTH
7000 FT

UPDATE ELV MSL
320.6 FT

DME

LAT
N30° 35' 59.71"

LON
W096° 21' 51.57"

ELEV
336.8 FT

CHAN
42Y

Threshold

TH-ELEV
304.3 FT

TH-ELLIP-ELEV
216.6 FT

MODEL / SOURCE
WGS84 / S

TH-LAT
N30° 34' 39.92"

TH-LON
W096° 21' 30.83"

HORZ. DATUM
NAD83

VERT. DATUM
NAVD88

CALC ELLIP HT
216.6 FT

IS DISPLACED

Facility   Setup   Results   Diagnostics   Alerts   ReplayChart

Run 1 : Idle   Inspection ready
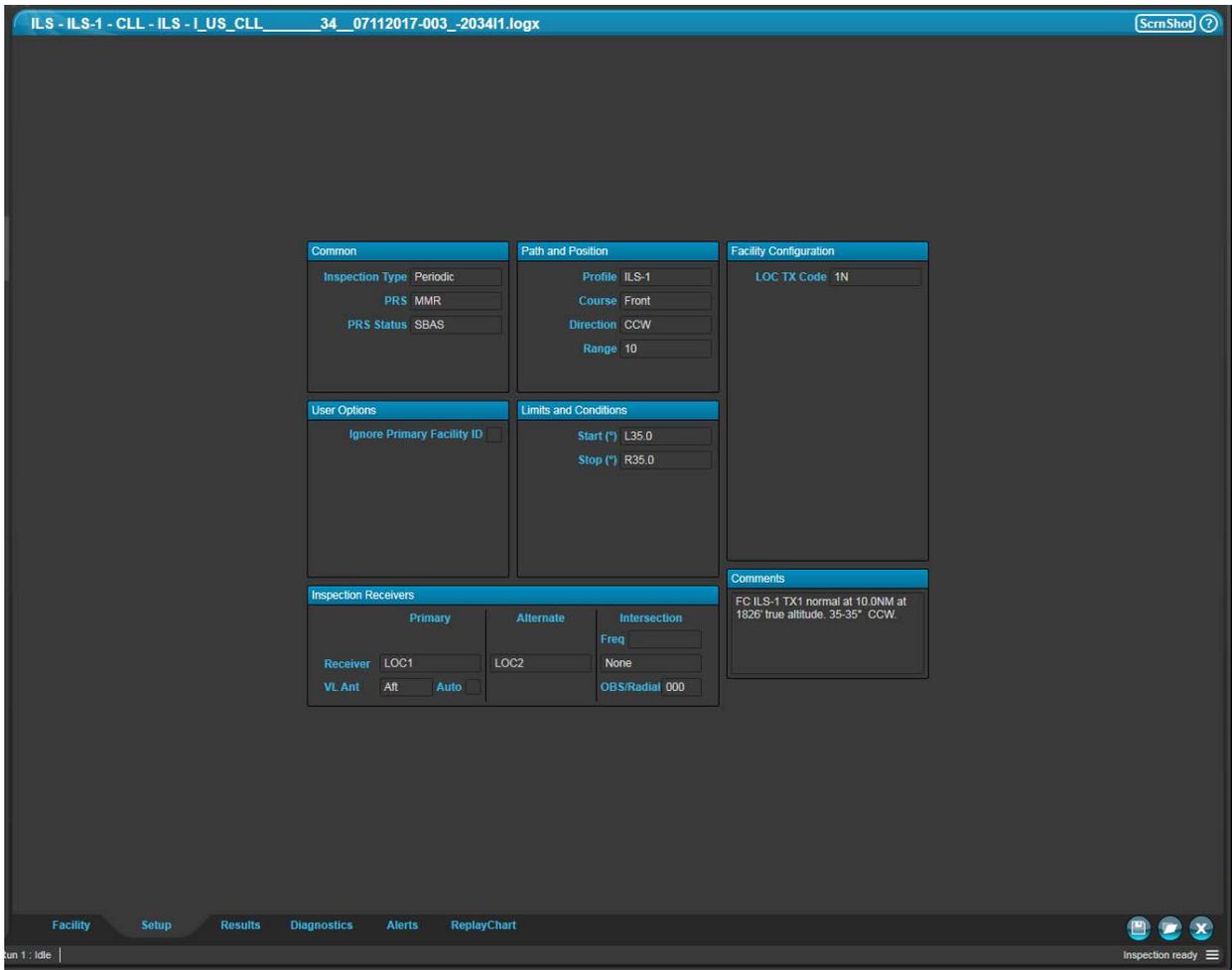
Fig 6. Facility Sub-Tab on Results Tab
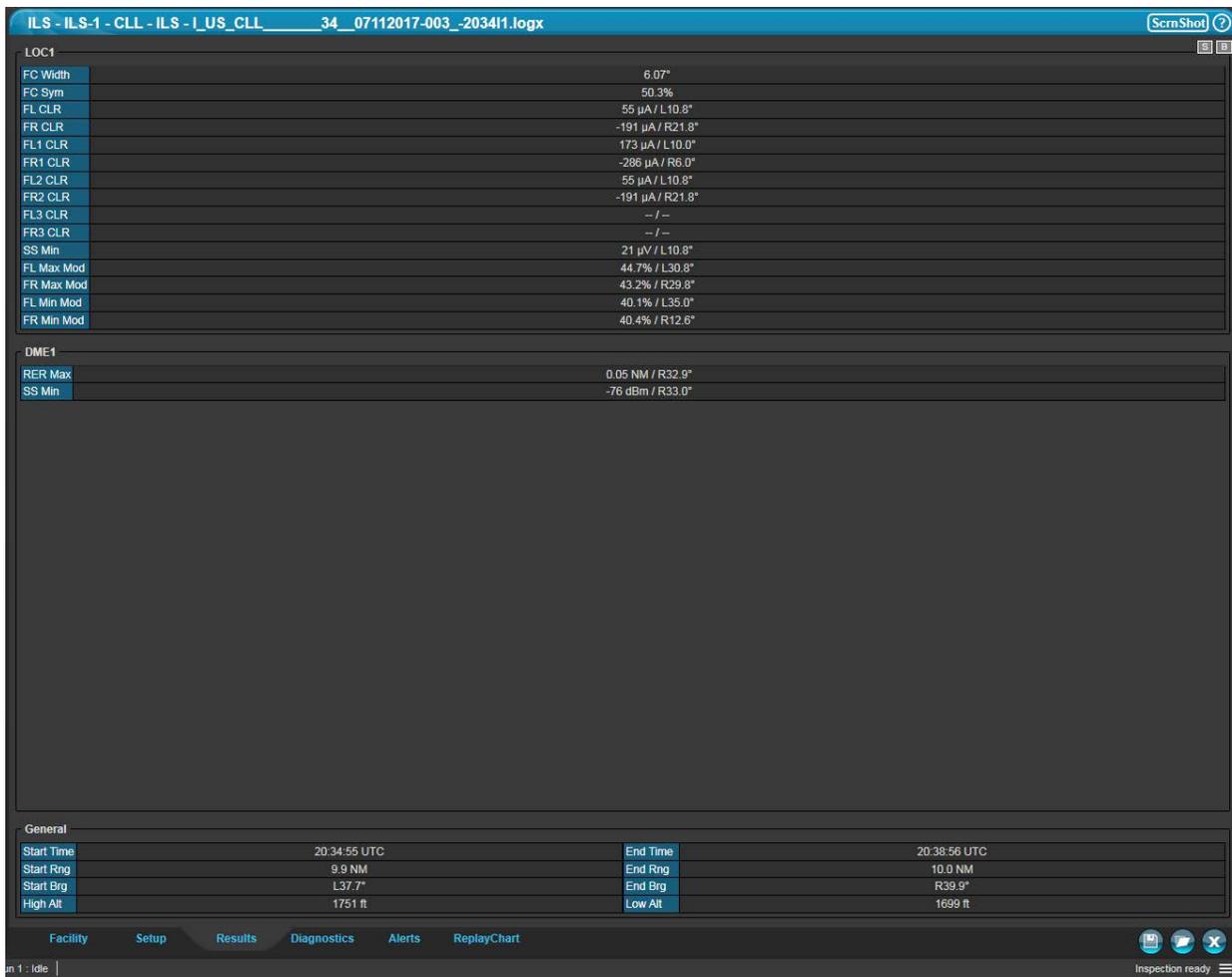
Fig 7. Setup Sub-tab on Results Tab

Fig 8. Results Sub-tab on Results Tab

The primary flight risk associated with the introduction of FIAPA was evaluated to be the increased likelihood of both pilots looking inside the cockpit at the iPads rather than clearing the flightpath and monitoring aircraft performance. This is due to the increased amount of information available on the iPad. The first mitigation of pilot attention focused inside the cockpit is to reduce the amount of time a pilot needs to find the information he is looking for on the iPad and thus allow him/her to revert attention back to the flight. This drove the choice of MS workflow as the template to cover FIAPA operation. A second mitigation was to emphasize the threat of aircraft collision due to lack of clearing. In addition, current FAA FI Guidance states in the Flight Inspection Services Operations Manual, TI 4040.50B Bulletin 17-01, paragraph F.(5)(d)4: "With the exception of navigational chart use on the Apple iPad, one pilot must monitor the aircraft and clear for traffic at all times during PED use in the cockpit." To emphasize these points, the instructor presented a collision threat to the aircraft and emphasized the need for adequate clearing after the discussion of every tab.

Fig 9. Collision Threat Example

SIMULATION

The two monitors used by the MS during normal flight inspection operations became the cornerstone of the academics; a central "map" of the workspace. This allowed the student to understand where each tab was located, the use of each tab as well as the flow typically used for an inspection. This method was selected because of the small viewing window provided by the VNC application. During use, a familiarity with the monitor geography is critical to understanding the information that is available and where a specific piece of information is located.   Students became familiar with the left and right monitors together, then each monitor independently.   Using a workflow of: Setup, Inspection and Analysis, each tab within the monitors was highlighted on the central map, then examined closely. The location of each tab was highlighted to show how to navigate to it and then the use of the tab was discussed. Then discussion moved to the use of the tab during inspection run setup, then to use during the actual inspection run and finally to use during the analysis of the inspection run. Instruction covered each tab and sub tab in the order the MS would typically address them. This method was chosen to give the pilot an understanding of which tab the MS would likely be paying attention to at a given point in the inspection process. This training flow addressed familiarity with the layout as well as an introduction to the MS workflow. As importantly, labels and lexicon were taught in the same general flow as would be experienced during an actual facility inspection.

During this training session, we emphasized pilot techniques as well. A key to pilot flow design is the understanding that all the pilot is seeing through the VNC app is also seen by the MS. This is a tremendous advantage in attaining a shared mental model of the upcoming inspection run and the facility inspection overall. An effective flow pattern for pilots is: Setup Tab to confirm facility and direction of run. This confirms the pilot and MS have coordinated for the next run. The pilot is setting the aircraft up for appropriate sensor position and the MS is setting up the FIS for appropriate facility data collection. As mentioned earlier, this is now non-verbal communication, allowing the pilot to devote more attention to flight path coordination/deconfliction and the MS to devote attention to the facility. After confirming setup, the pilot moves the VNC window to the SA Tab. This provides him with detailed information concerning the aircraft relation to the facility and the start point of the inspection run. Knowing the MS has the same picture of the SA Tab, the pilot knows if the MS has adequate information to prepare for the run commencement. When viewing the SA Tab, the pilot can also see the banner of the Results Tab. Knowing that when the MS begins the data collection the banner turns from blue to green, the pilot has non-verbal communication of a data collection run start. After the inspection run has been appropriately setup and data collection started, the pilot will move the VNC window to the Monitor Tab to receive near real time data during the inspection run. This allows him to see out of tolerance readings, confirm appropriate sensor and PRS use and to clearly see when the aircraft has entered

and exited the measurement zones. Again, this converts previously verbal communication into non-verbal communication. After the data collection run is complete, the pilot moves the VNC window to the Report Tab and observes the analysis of the run. Sharing a common picture with the MS, both will observe a satisfactory run; non-verbally understanding that the inspection may move on. Likewise, they will both observe out of tolerance (OT) conditions as well as anomalies; non-verbally understanding that the OT or anomaly must be addressed.

During the simulation training, students practiced using the EFB to view all the Tabs while an MS instructor runs the FIAPA simulator. This hands-on experience allows the students practice using this non-verbal communication process.

FLIGHT TRAINING

We conducted in-flight training using both the 4-day inspection itinerary method and the single day dedicated training mission method. The makeup of the itinerary was designed around the MS training requirements. Because the MS training program was much more robust and requirements were much more stringent, the pilot requirements were easily met without reducing the efficiency of MS training event scheduling. The student was the SIC during his training itinerary and would typically fly in the left seat as the PF the first day. This accomplished two objectives: first, the MS training was not impacted by a lack of proficiency as the instructing pilot would complete all new tasks and interact with the MS trainee. Second, the student pilot would concentrate on the aircraft while listening to the crew interaction. After the first day as PF, the student pilot would act as PF or PM relative to his ability to perform PM duties while monitoring the workflow via the iPad. By the end of the itinerary, the student pilot would fly as PM exclusively in order to reinforce the training without the primary responsibility of aircraft monitoring.

RESULTS

Both methods provided acceptable results. Generally, crew task management and inspection efficiency improved. This seemed to be due both to increased situational awareness, and improved communications between crew members. The design of the GUI and information provided proved to be an effective reference system. The pilots benefitted greatly from additional awareness of the facility status, but more importantly, in the ability to monitor the status of the preparation for the next run. On several instances, the FIAPA display was the key to discovering that the pilot was planning for a certain flight inspection maneuver, while the Mission Specialist was configuring the FIS for something completely different.

Monitoring the aircraft performance and clearing the flightpath proved to be a significant challenge. Initially, the student would be focused on the iPad for long periods of time. The teaching point would become understanding information requirements and accessing the appropriate information. Instructors found it necessary to police themselves as the desire to focus on the student iPad was great. The real risk of aircraft monitoring proved to be as high as anticipated.

Generally, training was effective and well received. A normal learning curve presented itself in the first few sorties (or hours if on a dedicated flight) students typically did not use the application effectively. By the end, most students had a grasp of information helpful to mission execution, where to find that information efficiently and the dangers inherent in using the application. We observed two detrimental results. The first there was a more than expected amount of push back by pilots. This may be explained by the simple presence of paradigm shift. Certain pilots are uninterested in change. Their point, if taken as a sign of conservativism, is that a proven technique should not be discarded for a new technique of equal or lesser utility. This is certainly a true concept, but we believe that the increased information translates directly to a more efficient and effective inspection. Given enough time to grow comfortable with the information provided, the pilots will find their own comfortable level of use. As trained Mission Specialists fly with many different pilots, they, as a group, will exert pressure in the course of crew interaction that will tend to standardize pilot usage at an optimum level.

The second and more disturbing detriment is the tendency of the interested and adept pilot to focus attention on the iPad display and reduce attentiveness to the external environment. This tendency was foreseen and training emphasized techniques and procedures to mitigate this risk. Clearly this is not an acceptable situation in the low-altitude, high traffic regime of flight inspection. Continued active mitigation is required.

FUTURE ENHANCEMENTS

The final evolutionary change planned is the addition of a pilot specific tab. This tab would be designed specifically to provide the information necessary for a pilot to efficiently and effectively support the flight inspection through normal ASIP functions

as well as aircraft command functions. The intent is to pare down the information to that required by the pilot and to arrange the information in the most easily accessed configuration. This will most likely mean that the information does not adequately support the MS in his duties, and will not be arranged in an efficient pattern for the MS workflow. Thus the tab conceivably be hidden from the MS during normal operations. Results from the initial training program are being used in the specification and design of this tab.

APPENDIX 1. NAFIS PHASE II TRAINING PROGRAM OUTLINE

5.4   NAFIS PHASE II (FIAPA) TRAINING FOR PILOTS

Delivery Method	Time (hrs)	Resources
Classroom	4	FIAPA Application desktop, AFMS
Lab	3	FIAPA Application Power Point/VNC
Flight	10	Aircraft / Crew

On completion of training, the pilot will:
- 5.4.1   <u>Understand</u> current issues with flight inspection of RNAV(GPS) and RNAV(RNP) Approaches.
  - 5.4.1.1   Review ARINC424 data elements associated with all RNAV Approaches
  - 5.4.1.2   Review current TFIG related to RNAV Approaches
  - 5.4.1.3   Review current state of PCV program and applicability to FIAPA RNAV Approach mode
- 5.4.2   <u>Understand</u> changes in RNAV Approach flight inspections and reporting
- 5.4.3   <u>Know</u> the basic FIS component changes from NAFIS Phase I to NAFIS Phase II.
- 5.4.4   <u>Know</u> new terms associated with FIAPA and available position reference sources (PRS).
- 5.4.5   Be <u>introduced</u> to each FIAPA mode and sub-mode that is Operationally Approved for Flight Inspection. This introduction includes how FIAPA is used for preflight preparation, during the inspection, and post mission.
- 5.4.6   <u>Understand</u> all differences in maneuvers/runs when using NAFIS Phase II to conduct flight inspection.
  - 5.4.6.1   FI Low Approaches for most RNAV(GPS) and RNAV(RNP) Approaches
  - 5.4.6.2   ASR/PAR distance and coverage runs
  - 5.4.6.3   PAR/VGSI coverage runs
- 5.4.7   <u>Understand</u> single fix TVPS/Pilot update and different PRSs.
- 5.4.8   Be <u>introduced to</u> how to view inspection data in FIAPA on their iPad using WiFi/VNC screen sharing.
- 5.4.9   (CL605 Pilot Only) Be <u>proficient at using</u> the FIAPA RMI for TACAN inspections.
- 5.4.10   (Legacy to NAFIS Phase II only) Know the basic FIS component changes from Legacy (paper) to NAFIS Phase II.