Data Communications Program

Aeronautical Charting Forum Briefing

Presented To: ACF 15-01 Charting Group Audience

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Data Comm Program

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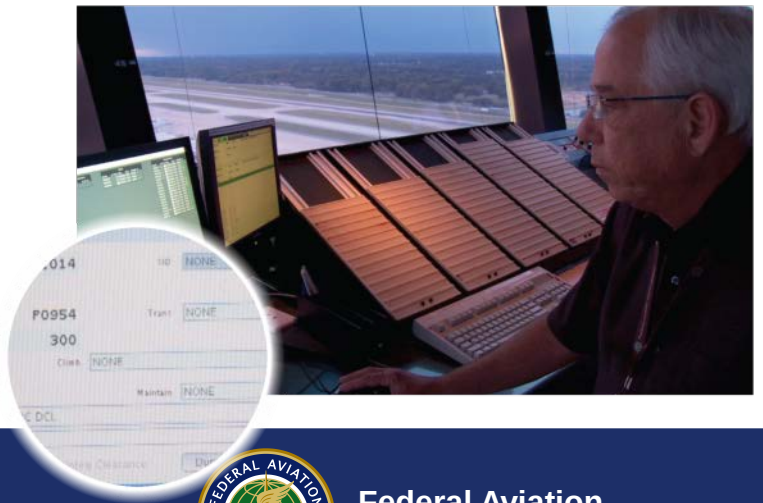
Program Overview

- Provides data communications services between pilots and air traffic controllers, supplementing existing voice communications capabilities
- Provides a data link between ground automation systems and flight deck avionics for air traffic control (ATC) clearances, instructions, traffic flow management, and flight crew requests
- Controllers will be able to deliver instructions with a push of a button and without the need to utilize voice frequencies
- Enables the transmission of complex instructions to be quickly and correctly loaded into an aircraft's flight management system, upon acceptance by the pilot



Benefits of Data Comm

Reduce communication time between controllers & pilots

Improve re-routing around weather and congestion

Increase flexibility and accommodation of user requests

Enable NextGen Initiatives & Trajectory-Based Operations

Throughput/Efficiency

- Delay
- Fuel Burn

Controller Pilot/Efficiency

- Communication Time
- Controller Workload

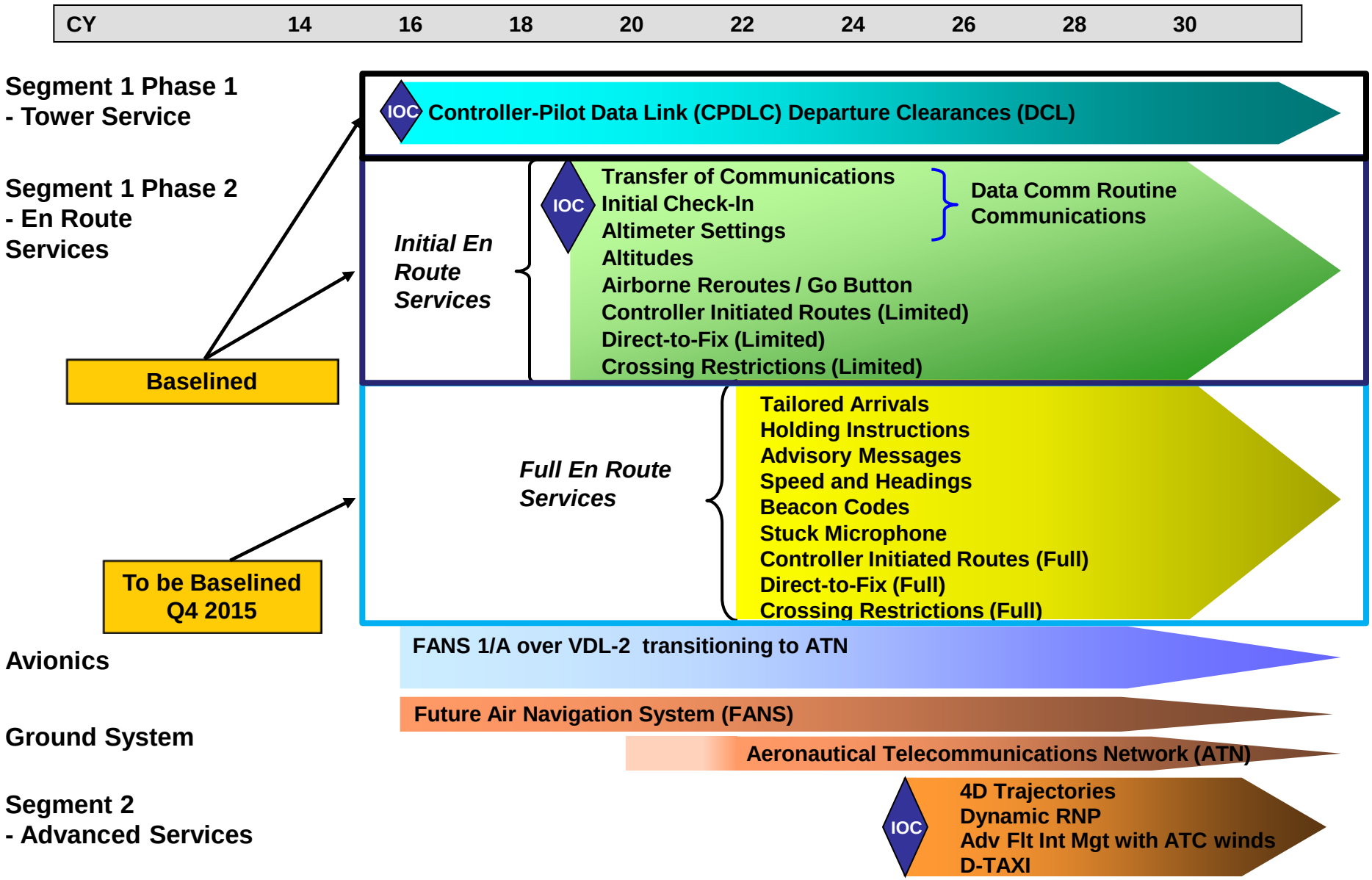
Environmental

- Emissions (CO_2)

Safety

- Read/hear back errors
- Loss of Comm events
- System Risk Event Reductions

Program Services Roadmap



S1P1 Tower Status

- **Completed Tower Data Link Services (TDLS) V11 Tech Refresh – all TDLS locations – December 2014**
- **TDLS V12 developmental releases being delivered to support integration and test activities at the Tech Center**
  - TDLS V12 with Data Comm turned off scheduled for Key Site operational use in April – May
- **Completed ERAM hardware installation, integration, and test at Salt Lake City (ZLC) and Atlanta (ZTL) – June 2014**
- **ERAM software development complete**
  - Successfully completed ERAM transition testing in January 2015
- **FTI service cutover at Salt Lake City (ZLC) in January 2015 with Atlanta (ZTL) to be in April 2015**
- **Coordinating with air carriers to support test and deployment**
  - Eight air carriers signed MOAs to participate in the equipage initiative
- **Completed system-of-systems integration and test activities at WJHTC**
- **Installation @ BOI & SLC occurred in past 2 weeks**

Air Traffic Concept of Use & Overview of the Departure Clearance (DCL) Service

Key Data Comm Terminology

- ***Logon:*** Pilot requests DCL service via logon. Logon processing performed to establish the identity and data communications capabilities of a flight desiring data communication services
- ***Correlation:*** process to ensure a controller-to-pilot data link communications (CPDLC) session is established with *one and only one* aircraft aircraft and an individual flight plan
- ***Session:*** a virtual connection between TDLS and the aircraft for the exchange of CPDLC messages
- ***Blocked List:*** list of aircraft disallowed from logging on. Blocked status for an aircraft may be system-generated (e.g., too many invalid logon attempts) or manually added (or removed) from an AT Specialist Workstation
- ***Abbreviated Flight Information (AFI):*** the subset of flight object information needed to provide DCL service

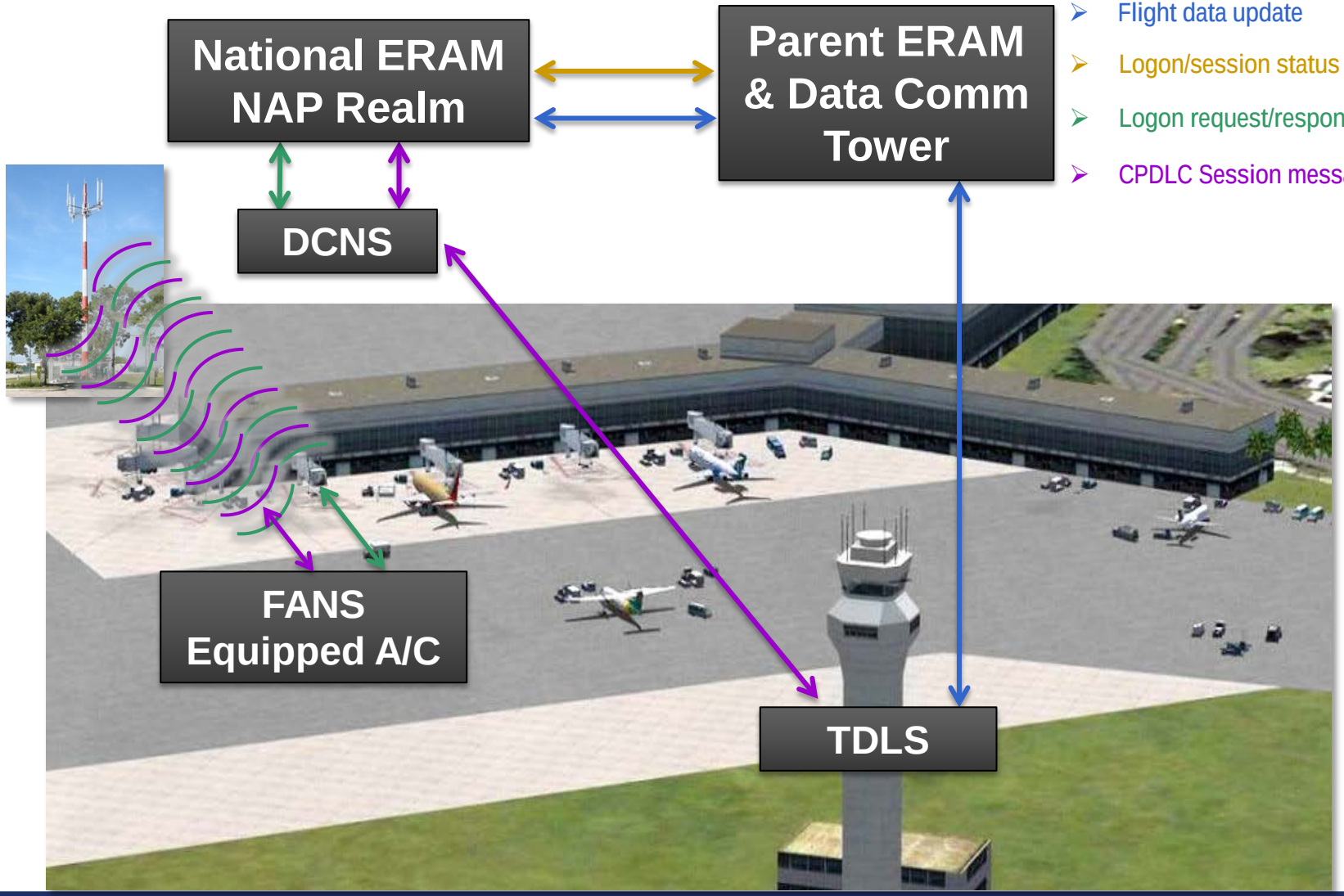
Tower Data Link Services (TDLS) System

- **TODAY:**
  - Provides Pre-Departure Clearance (PDC) Service via Ground-Ground 2nd party delivery (FOC or Gate). User determines A-G or G-G after receipt.
    - One Shot Delivery capability
  - Digital ATIS (D-ATIS) via local digitized voice broadcast & to subscribers from TIMS
  - FDIO Emulation
- **TOMORROW:**
  - Adds Departure Clearance (DCL) Service via direct A-G connection to FANS equipped aircraft
  - Similar to voice in that it's a two-way exchange with the Flight Crew
  - Provides multiple message exchange capability for revisions
- **DCL is a new Data Comm Service**
  - Does ***not*** replace PDC
  - TDLS will support both PDC and DCL services
  - Currently, not slated for all TDLS towers

DCL Operations

- **For PDC aircraft**
  - Same as today for Pilots
  - Same as today for Flight Dispatchers / Automation
  - Same as today for Clearance Delivery controllers
    - Uses slightly modified TDLS CHI
  - Same as today, go to voice when questions or backlog
- **For Data Comm equipped aircraft:**
  - Pilot must ***logon*** to receive DCL service
  - Clearance Delivery controller prepares and sends initial clearance electronically in same manner as revised clearance
  - Pilot receives, responds to, and enters initial clearance in same manner as revised clearance
  - Pilot proceeds with operation with minimal delay
- **Two new functions (apply to both Tower & EnRoute)**
  - Logon queries
  - Blocked List management

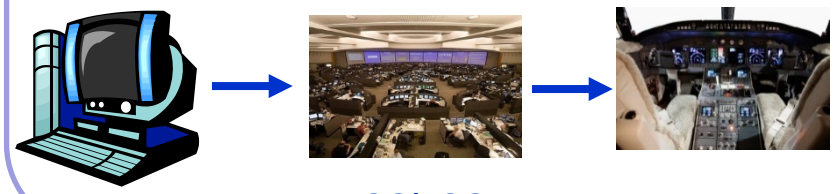
Data Comm FANS Message Data Flow



Operational Comparison: PDC & DCL SERVICES

PRE-DEPARTURE CLEARANCE

- Clearance sent from TDLS to Flight Operations Center (FOC) / Aeronautical Operations Center (AOC)
- FOC / AOC delivers clearance to aircraft subscribed to PDC
- ***Controller issues departure clearance revisions verbally***



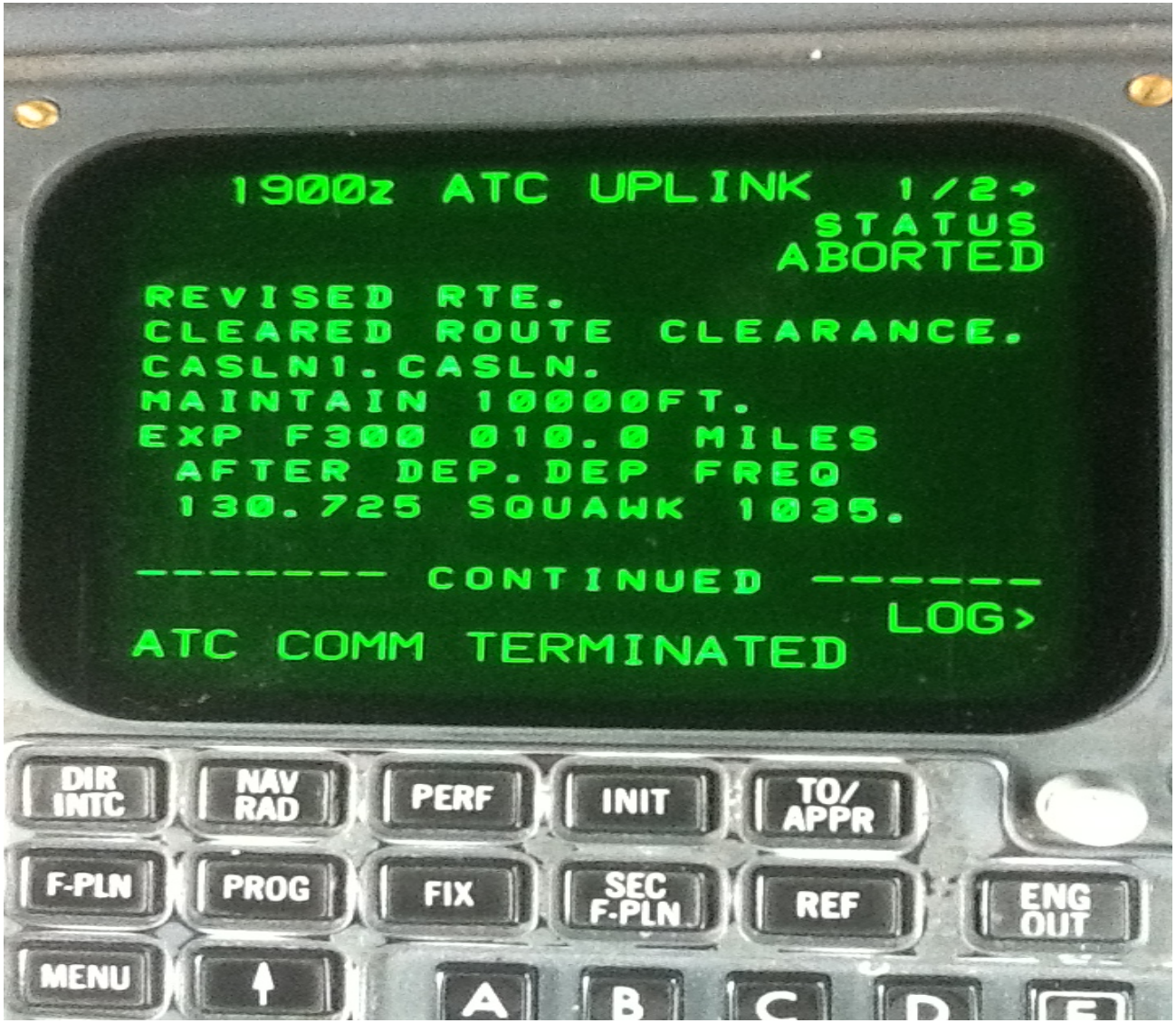
DEPARTURE CLEARANCE

- Direct digital communications path between the controller and the pilot
- Clearances issued ***ONLY*** to the cockpit of suitably equipped aircraft
- Once the pilot accepts, they load the DCL into the aircraft's FMS
- Dispatch Copy of departure clearance to FOC/AOC, when requested
- ***DCL enables digital delivery of revisions***

Pilot's Perspective of DCL

- Pilot initiates Logon Request
- Pilot receives indication of response
- Pilot receives indication of session establishment (implies DCL is ready)
- When ready, pilot requests DCL
- Pilot receives uplink indication
- Pilot reviews DCL
- Pilot responds with WILCO, Roger, Standby, Unable
- Accepts Revisions as required
- Aircraft departs
- Session terminates ~10 mins after takeoff

Full Route Clearance – Page 1



Full Route Clearance – Pages 2 & 3

Logon Queries

- **Purpose: Identify reason a pilot attempt to log on was unsuccessful**
  - Pilot receives indication that LOGON request failed
  - Cannot receive DCL service without accepted LOGON
  - Reasons for an unsuccessful LOGON
    - Ground or air system anomaly
    - Data corruption
    - **Pilot data entry error**
    - Suspected duplicate aircraft registration
    - Aircraft intentionally blocked from logging on (i.e., on Blocked List)
- **Logon processing and status is maintained within ERAM (including failure reason(s))**
- **Logon queries**
  - Real-time using Logon Query View is conducted @ 2 National ERAMs by Flight Data Communications Specialists (FDCS)

Program Requirement/Recommendation

- **Add “CPDLC” information to the Airport Diagram, Terminal Procedures Pages & updates to the Airport Facility Directory**
- **Ensures advance notification for Flight Operations to prepare the flight correctly**
- **Will help flight crews select the appropriate Data Comm application to participate in CPDLC services now & in the future (avoid confusion with legacy 623 DCL)**

We need this incorporated in the next chart cycle in October 2015

Program Impact if Recommendation Not Adopted

- **Incorrect flight ops preparation**
- **Confusion for flight crews on what service is provided**
- **Increased flight crew/controller workload needed to clarify service provision during flight preparation**

Future Requirement

- **Evolution of the LOGON requirement**
  - En Route services require single LOGON for all of US
  - Reduces communication workload on transition between Towers and Centers
- **Will change from individual airport codes to a single national data communications code**
  - e.g., KMEM to KUSA
- **Increased charting needs for external transition into the NAS**

Needed to support En Route Operations beginning in 2018

Data Comm S1P1 Tower Waterfall

Keysite (3 Towers)			
Site Name	**Site ID**	**ARTCC ID**	**IOC**
KS 1: Salt Lake City	SLC	ZLC	**Q3 2015**
KS 2: Houston Intcl	IAH	ZHU	Q3 2015
KS 3: Houston Hobby	HOU	ZHU	Q3 2015

Group A (19 Towers)			
Site Name	**Site ID**	**ARTCC ID**	**IOC**
New Orleans	MSY	ZHU	Q1 2016
Austin	AUS	ZHU	Q1 2016
San Antonio	SAT	ZHU	Q1 2016
Los Angeles	LAX	ZLA	Q1 2016
Las Vegas	LAS	ZLA	Q1 2016
San Diego	SAN	ZLA	Q2 2016
John Wayne	SNA	ZLA	Q2 2016
Bob Hope	BUR	ZLA	Q2 2016
Ontario	ONT	ZLA	Q2 2016
San Francisco	SFO	ZOA	Q2 2016
Oakland	OAK	ZOA	Q2 2016
San Jose	SJC	ZOA	Q3 2016
Sacramento	SMF	ZOA	Q3 2016
Phoenix	PHX	ZAB	Q3 2016
Albuquerque	ABQ	ZAB	Q3 2016
Seattle	SEA	ZSE	Q3 2016
Dallas Love	DAL	ZFW	Q4 2016
Dallas FTW (x2)	DFW	ZFW	Q4 2016

Group B (17 Towers)			
Site Name	**Site ID**	**ARTCC ID**	**IOC**
Louisville	SDF	ZID	Q1 2016
Indianapolis	IND	ZID	Q1 2016
Cincinnati	CVG	ZID	Q1 2016
Memphis	MEM	ZME	Q2 2016
Nashville	BNA	ZME	Q2 2016
Denver	DEN	ZDV	Q2 2016
Atlanta	ATL	ZTL	Q2 2016
Charlotte	CLT	ZTL	Q2 2016
Jacksonville	JAX	ZJX	Q2 2016
Orlando	MCO	ZJX	Q3 2016
Miami	MIA	ZMA	Q3 2016
Fort Lauderdale	FLL	ZMA	Q3 2016
Tampa	TPA	ZMA	Q3 2016
Palm Beach	PBI	ZMA	Q3 2016
St Louis	STL	ZKC	Q4 2016
Kansas City	MCI	ZKC	Q4 2016
Minn-St Paul	MSP	ZMP	Q4 2016

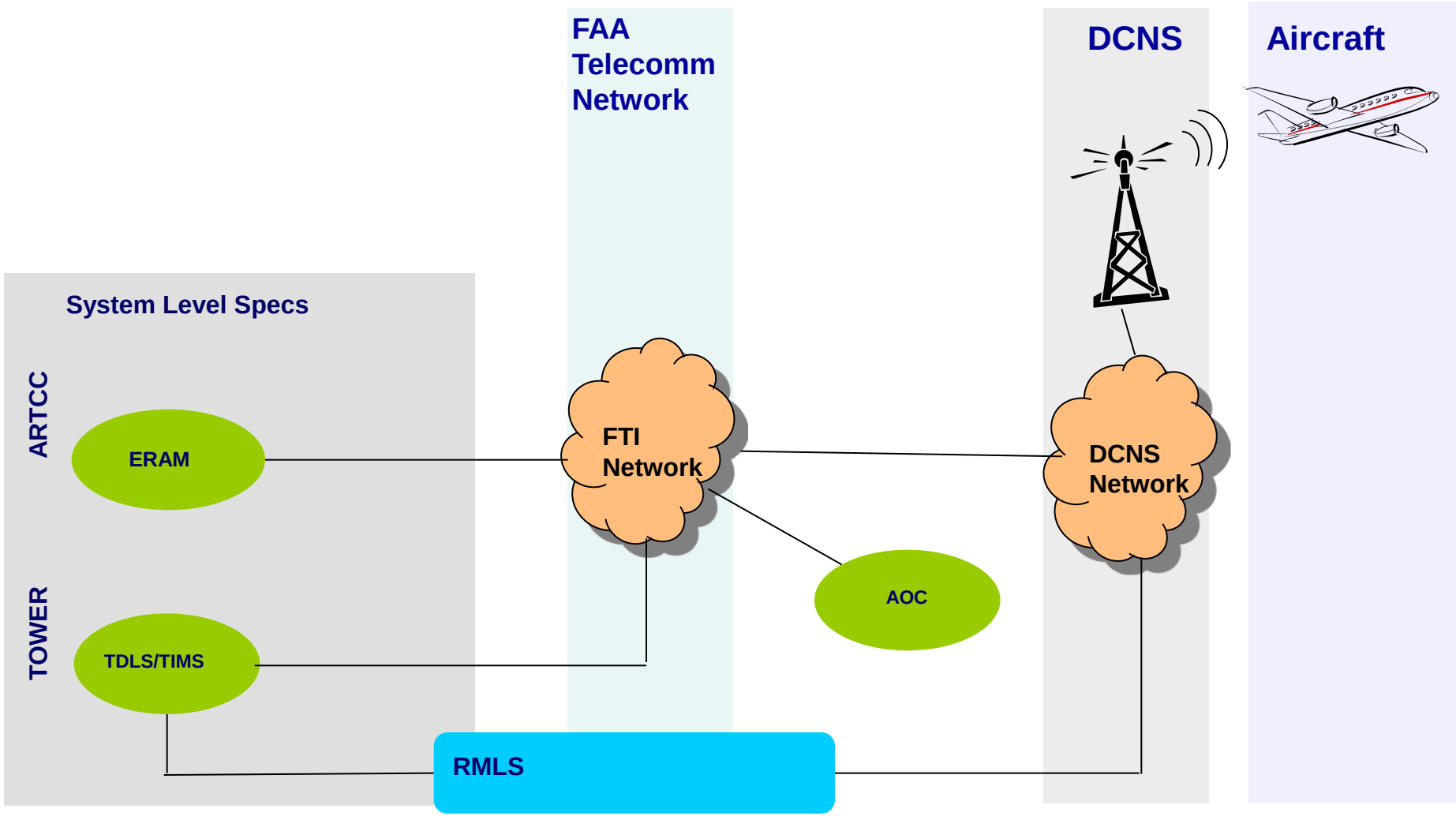
Group C (18 Towers)			
Site Name	**Site ID**	**ARTCC ID**	**IOC**
Newark	EWR	ZNY	**Q1 2016**
J F Kennedy	JFK	ZNY	**Q1 2016**
La Guardia	LGA	ZNY	**Q1 2016**
Teterboro	TEB	ZNY	**Q1 2016**
Westchester	HPN	ZNY	**Q2 2016**
Philadelphia	PHL	ZNY	**Q2 2016**
Boston	BOS	ZBW	**Q2 2016**
Providence	PVD	ZBW	**Q2 2016**
Bradley	BDL	ZBW	**Q2 2016**
Detroit	DTW	ZOB	Q3 2016
Cleveland	CLE	ZOB	Q3 2016
Pittsburgh	PIT	ZOB	Q3 2016
Balt/Wash	BWI	ZDC	Q3 2016
Dulles	IAD	ZDC	Q3 2016
Reagan	DCA	ZDC	Q3 2016
Raleigh/Durham	RDU	ZDC	Q4 2016
Chicago Midway	MDW	ZAU	Q4 2016
Chicago O'Hare	ORD	ZAU	Q4 2016

- **Waterfall reflects challenge schedule dates (calendar year)**
  - Baseline schedule Tower deployment dates are 2016-2019
- **Will deploy En Route Services to all 20 ARTCCs starting in 2018 (challenge date)**

The Data Comm Stakeholder Cloud

Thank You !!!

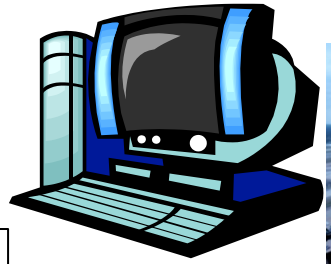
Data Comm Architecture



Service Components

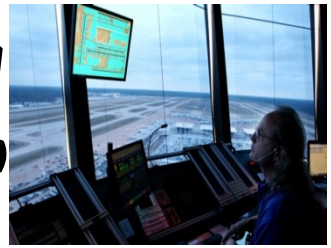
ERAM

- Processes logon information
- Performs Logon-to-FP Correlation
- Flight Data, Logon Data for proposed flights to TDLS
- Provides security gateway (PGW FEP & DCGS BEP)



TDLS

- Requests correlated logon-to-flight data from ERAM
- Initiates session with the aircraft
- Sends DCL to aircraft



Tower Controller

- Picks flight from Pick List
- Processes initial DCL
- Processes revised DCL
- Solves the issue of multiple proposed flight plans, if necessary

AOC/FOC

- Populates subscriber list
- Files FPs w/preferences
- Sends Gate ID when Dispatch Copy is received
- Coordinates w/Crew on revisions, if necessary

Aircraft

- Processes Logon, Requests & Responses
- Establishes Sessions
- Processes Pilot DCL Requests & responses
- Provides indications to Pilot

Pilot

- Initiates Logon
- Requests initial DCL
- Responds when DCL or Revised DCL is received
- Coordinates with AOC/FOC on revisions, if necessary