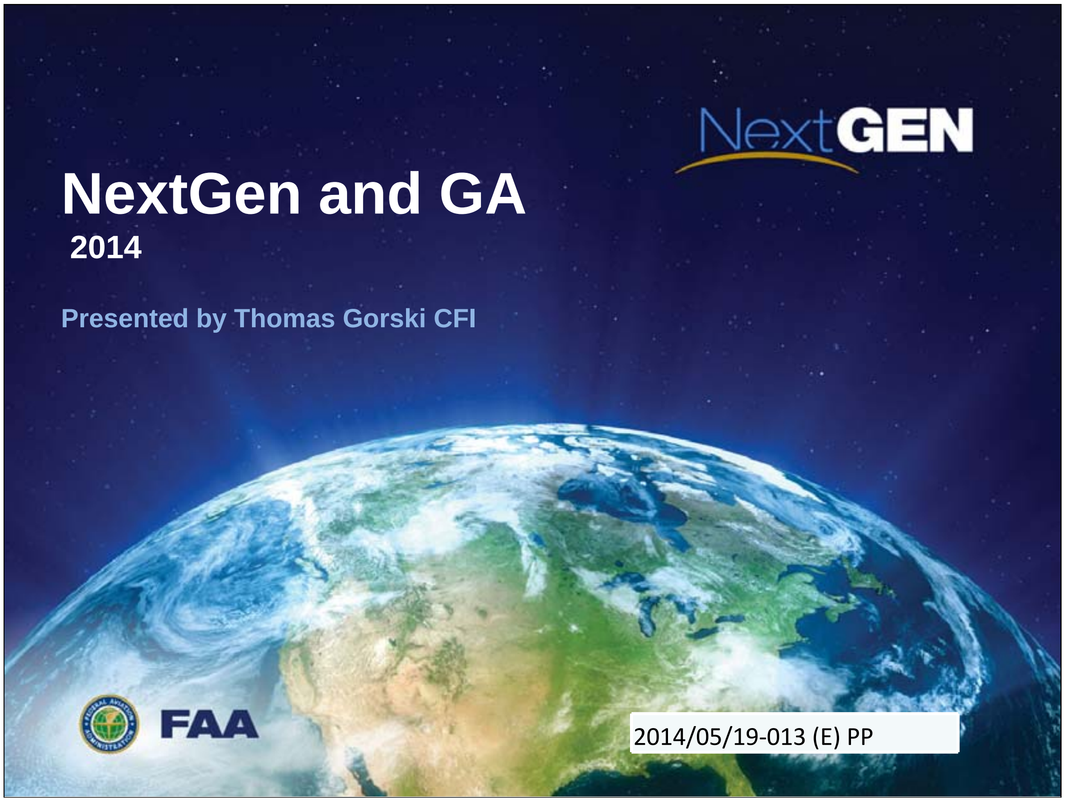


2014/06/17 Thomas Gorski, CFI 503-551-1700

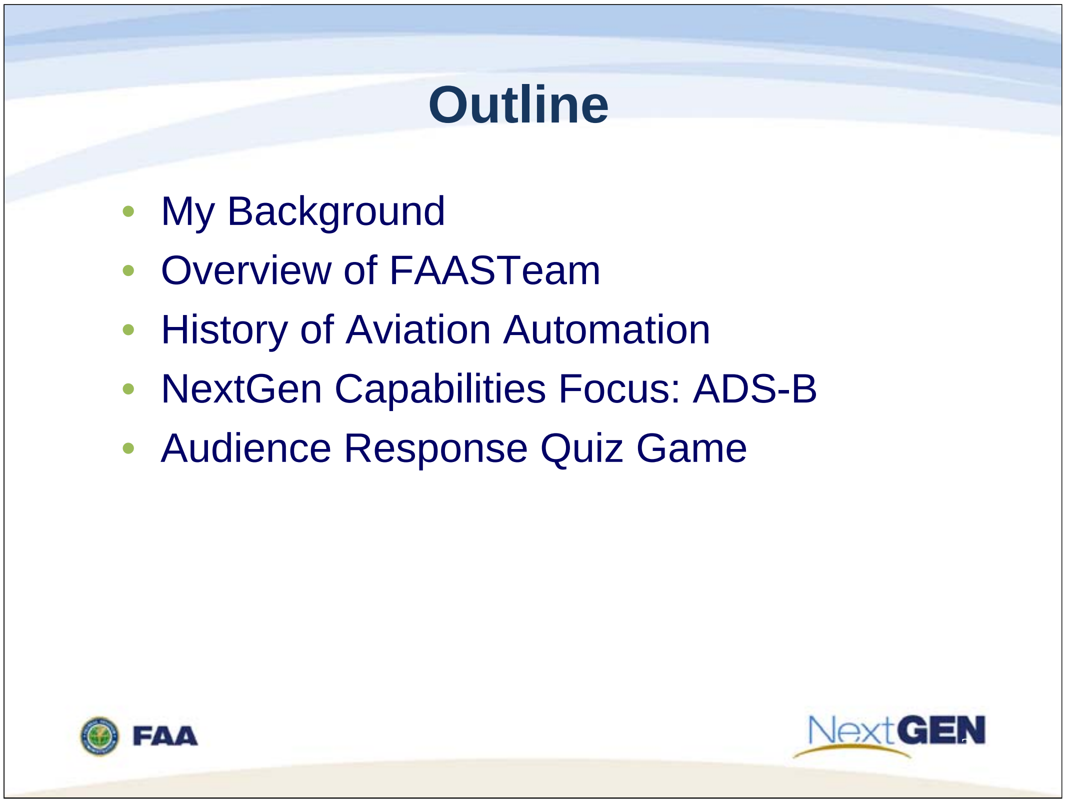
Original FAA Material: 2014/05/19-013 (E) PP POC Kevin Clover, AFS-850, phone: 562—888-2020

Interactive presentation style: Ask relevant questions frequently. It is more important to address your concerns than to present without regard for your questions.

Holding pattern for unanswered questions.

As long as all the information gets out, the number of sidebar questions and discussions are unlimited.

(Next Slide)



We want to take just a few minutes to talk about Infrastructure initiatives. (**Click)**

We'll talk about the history of Aviation Automaton**. (Click)**

We'll discuss NextGen in terms of understanding what it is all about, capabilities and initiatives**. (Click)**

And we'll look closely at the cornerstone of NextGen: ADS-B offer some tips for successful operations in the RNAV environment, and discuss WAAS, LPV and EFB's **(Click)**

Finally we will play an audience response quiz game.

(Next Slide)

My Background

- 1976 – US Army Avionics Technician GA, WA
- 1984 – CFI & Part 135 NJ, WA, OR, CT
- 2004 – FO LR-25, 35, 55 TX, & FL
- 2006 – 2007 CA LR-35/CE500 Part 135 North America, Africa, Middle East
- 2008 – FO Part 121 B747-200 & 400 Worldwide
- 2010 – CA B-747-400 Director of Flight Standards
- Present Owner ASR Products & Services

FAA NextGEN

(Next Slide)

Activities of the FAASTeam are organized primarily through a Website, and through the local FAA FSDO.

(Next Slide)

Mission Statement:
Improve the Nation's aviation accident rate by conveying safety principles and practices through training, outreach, and education; while establishing partnerships and encouraging the continual growth of a positive safety culture within the aviation community.

(Next Slide)

FAASTeam Members are individuals who makes a conscious effort to promote aviation safety and become part of the shift in safety culture. Members are:
Pilots - WINGS

Mechanics - AMT

People - Attend Seminars **(Next Slide)**

Promote a positive safety culture.

Together, as a team, we can make a difference by reducing aviation accidents!

Thank you for being part of the shift toward a more positive safety culture!

(Next Slide)

History of Aviation Automation

NextGen is the continuous modernization of our national airspace. A comprehensive set of initiatives that integrates new air traffic technologies and procedures that is transforming how we manage our skies. Video about Next Gen

Procedural Based Control:
Control on Where We Think the Aircraft Is

Surveillance Based Control:
Control on Where We Know the Aircraft Is

Satellite Based Control:
Control on Where We Know the Aircraft Will Be

As an intro to the presentation – load up "We Build Our Future" it will give the audience some perspective on how NextGen compares to the major infrastructure initiatives our country has taken on and achieved!

Link to "We Build Our Future"
http://www.tomgorski.com/video/nextgen_768.wmv

Poster "Why Nextgen Matters"
http://www.faa.gov/nextgen/library/images/WhyNextGen.jpg

We are moving to a system that gives pilots and controllers greater predictability and allows us to better and more safely manage the movement of aircraft.

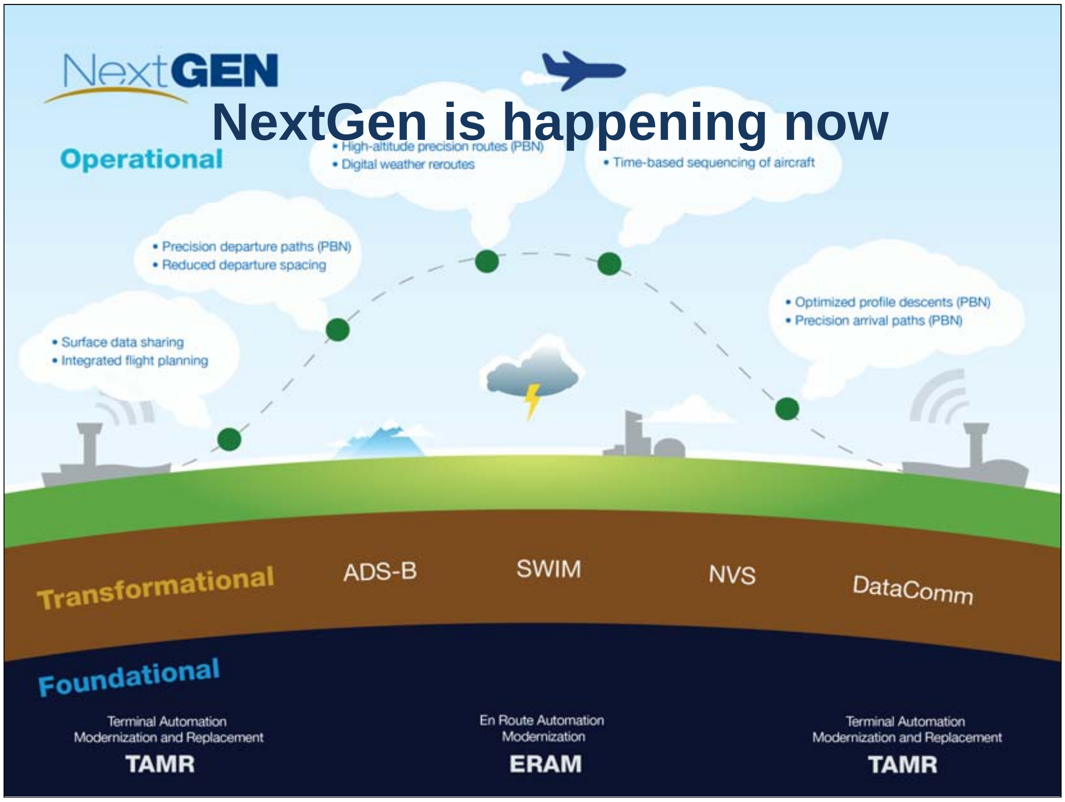
•All ADS-B Radio Stations are now installed across the country.

•ERAM (En-route Automation Modernization) is now operating in some capacity at 16 of 20 en route centers in the United States All ERAM sites are now on Release 3, which includes NextGen ADS-B capabilities

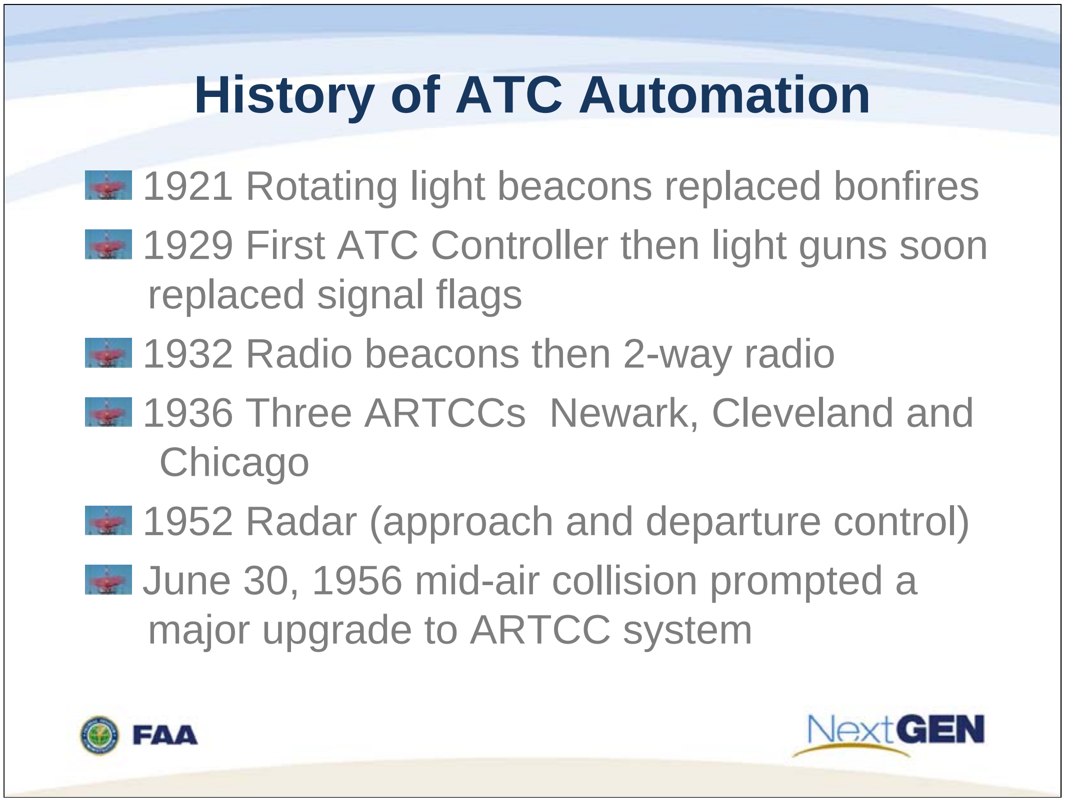
•Data Comm replaces voice communications with text communications.

•GPS, augmented with WAAS, provides the national airspace with a satellite-based capability to determine an aircraft's airborne position with accuracy for en route navigation, non-precision approach, and precision approach. The new technology — cheaper and easier to install and maintain than traditional navigation aids — will lower minimums at many airports and give new access during bad weather.

•Using WAAS, aircraft can access over 2,500 runway ends in poor weather conditions with minimums as low as 200 feet. WAAS can even get pilots into places where the Instrument Landing System (ILS) may not be available. This milestone has an additional benefit for pilots and passengers across the national airspace, as ILS technology fades and needs repair and maintenance, replacing them with the more precise technology is now an option.



- We are nearing the end of the foundational phase and the transformational programs are being integrated into the operation of the national airspace. ERAM is the new way to manage traffic in the airspace – it stands for En Route Automation Modernization
- ADS-B is the successor to Radar and is a key benefit to GA (more is coming in the presentation), SWIM is System Wide Information Management that provides cloud based sharing of important aviation data and information, NVS is the National Voice System which enhances communication between all users of the airspace and Data Comm which is the movement from voice to text communication.
- By 2015, we expect to have completed the infrastructure that will enable additional layers of operational improvements.
- Think of this foundation as a Tablet Personal Computer on which NextGen “applications” can be installed to provide benefit in the NAS.
- The tablet PC, itself, is not NextGen, but the capabilities it enables are.
- It is on this foundation that the FAA will continue to implement the transformational technologies that provide operational benefits to users throughout the NAS. All of the rule making for what equipment GA needs for ADSB in/out in 2020 is complete. The manufacturers know what is needed and the FAA has hit it's milestones for the installation of the radio stations that are the ground infrastructure.



1921 Rotating light beacons replaced bonfires

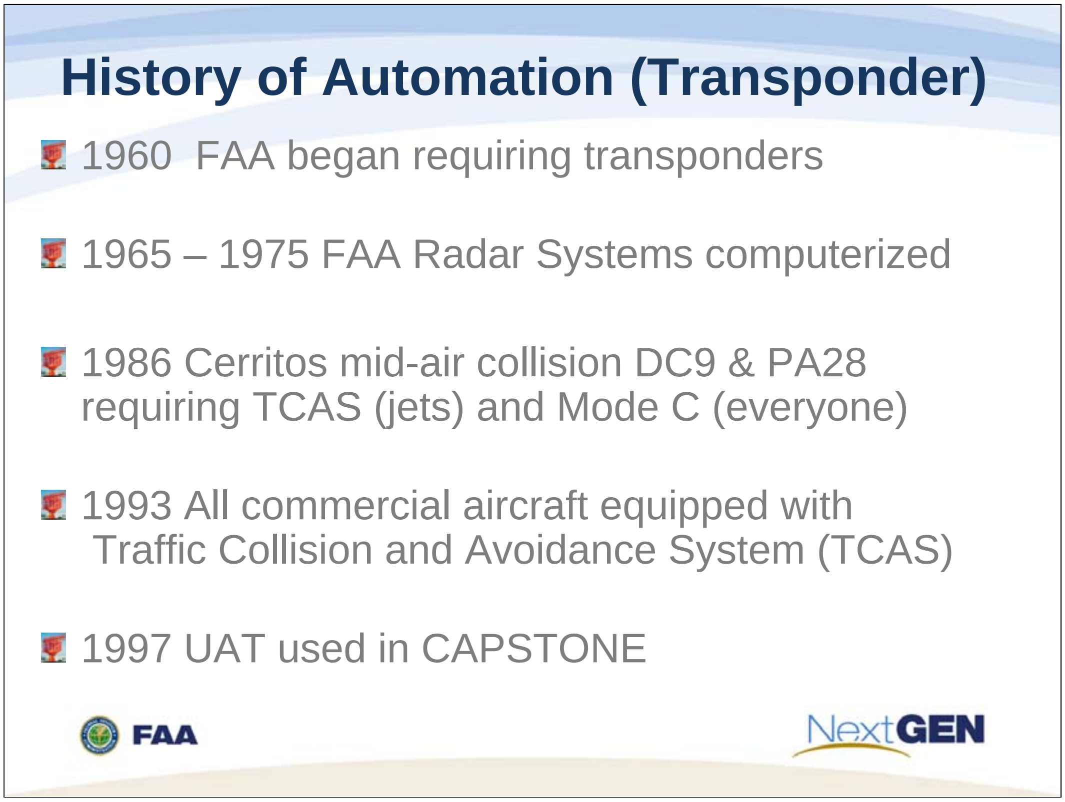
1929 First ATC Controller. Light Guns soon replaced signal flags

1932 Radio beacons then 2-way radio

1936 Three ARTCCs Newark, Cleveland and Chicago

1952 Radar (approach and departure control)

June 30, 1956 prompted a major upgrade to nations ARTCC system



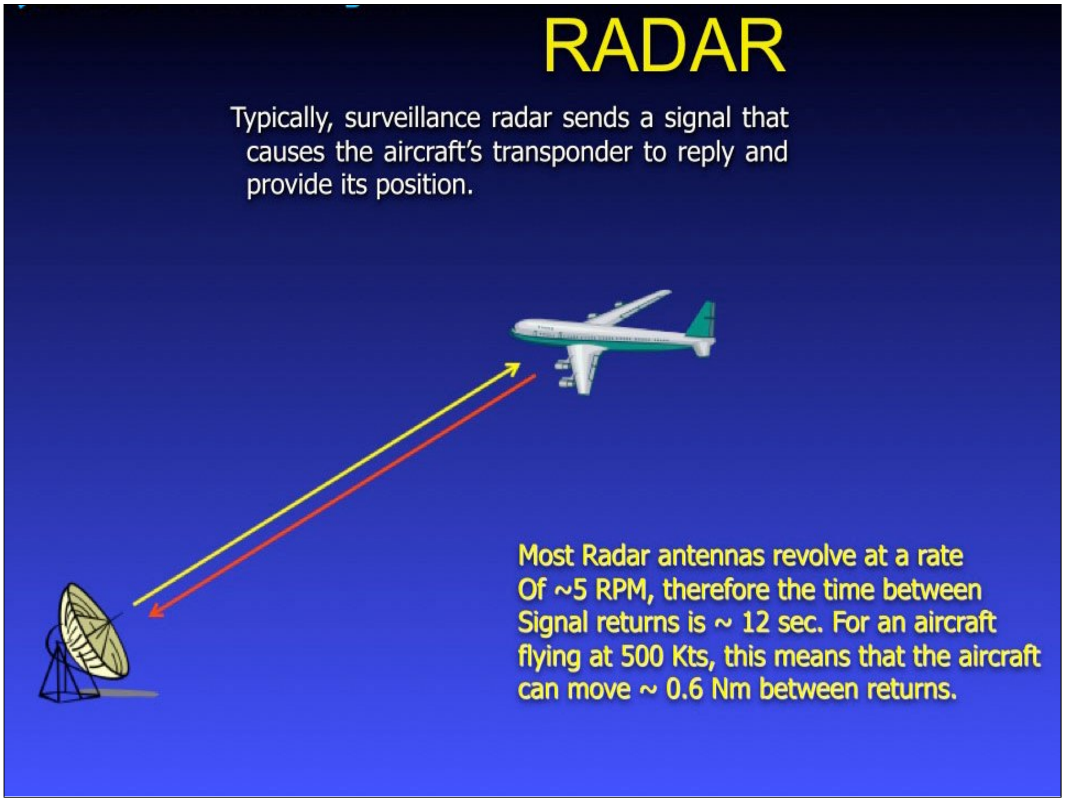
1960 FAA began requiring transponders

1965 – 1975 FAA Computerized Radar System

Mid-air collision in 1986 Cerritos DC9 & PA28 requiring TCAS (jets) and Mode C (everyone)

Congress passes law mandating all commercial aircraft be equipped with a Traffic Collision and Avoidance System (TCAS) by 1993

1997 UAT used in CAPSTONE


RADAR
Typically, surveillance radar sends a signal that causes the aircraft's transponder to reply and provide its position.
Most Radar antennas revolve at a rate Of ~5 RPM, therefore the time between Signal returns is ~ 12 sec. For an aircraft flying at 500 Kts, this means that the aircraft can move ~ 0.6 Nm between returns.

The Potential

- Currently, when flying in or out of non-towered airports without radar service, IFR Departures and arrivals can only occur one at a time, resulting in long delays between aircraft.
- ADS-B creates the potential for reducing these delays by more accurately reporting aircraft positions to ATC in areas where radar coverage was previously unavailable.

FAA NextGEN

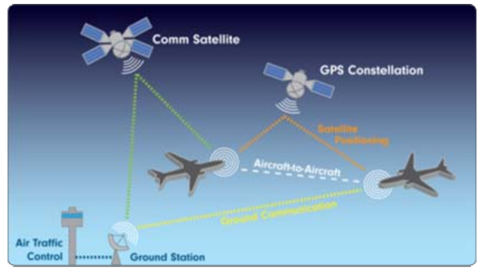
Currently, when flying in or out of non-towered airports without radar service, IFR Departures and arrivals can only occur one at a time, resulting in long delays between aircraft.

ADS-B creates the potential for reducing these delays by more accurately reporting aircraft positions to ATC in areas where radar coverage was previously unavailable.

Automatic Dependent Surveillance - Broadcast

- **Automatic** – Always on and requires no operator intervention. Equipped aircraft automatically report position
- **Dependent** – ADS-B is dependent on an accurate GNSS signal – and T/R
- **Surveillance** – Provides radar like surveillance services - much like RADAR
- **Broadcast** – aircraft broadcast their position and data to any aircraft ADS-B equipped and ATC ground stations

Automatic--no interrogation needed to start the sinal coming from the transponder



Dependent— relies on onboard navigation and broadcast equipment to provide info to other ADS-B users

FAA

NextGEN

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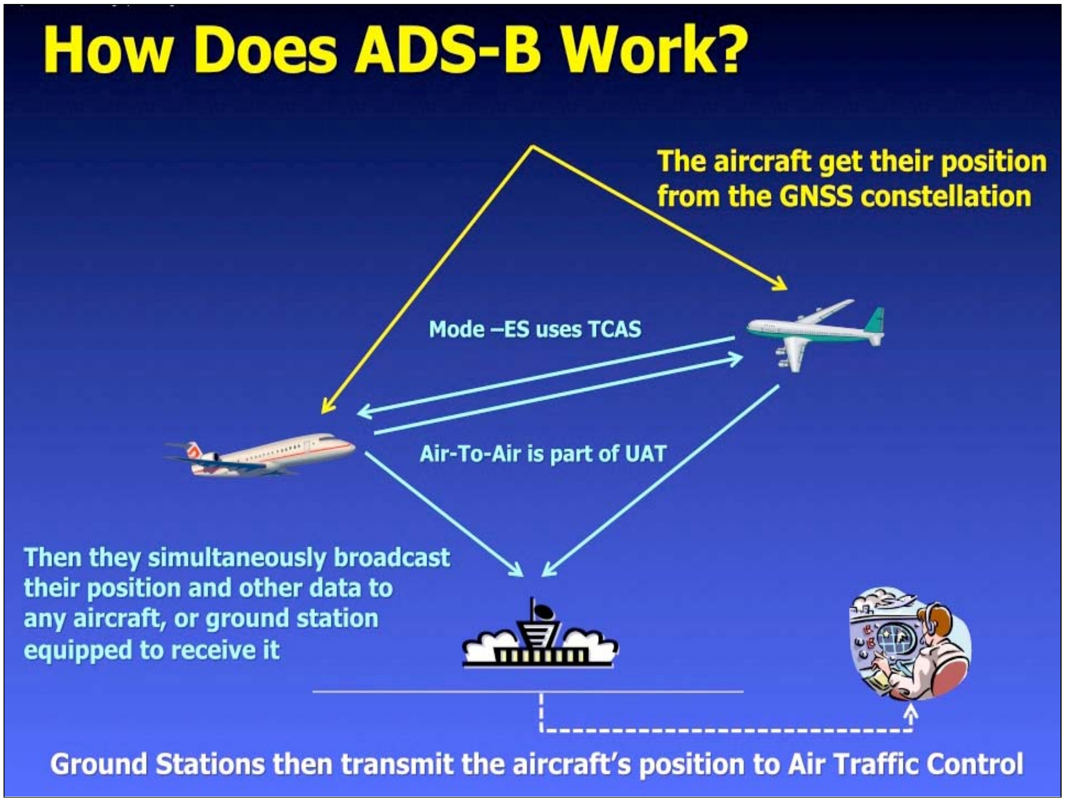
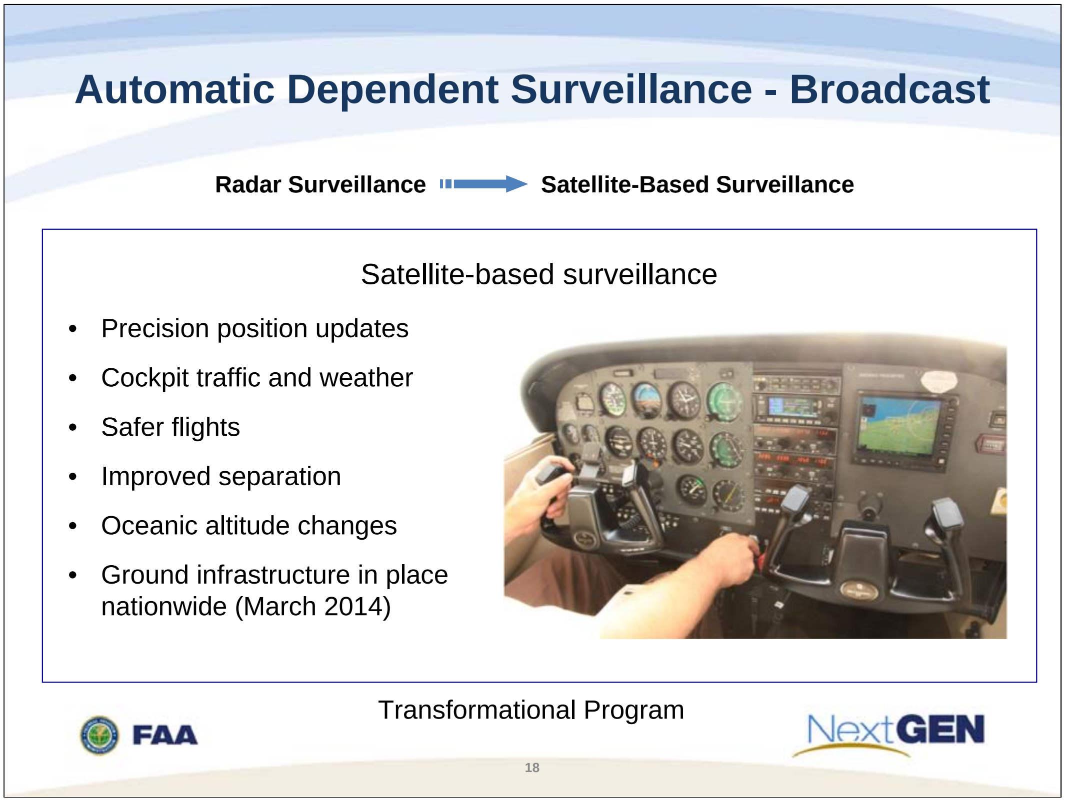
What is ADS-B?
Breaking down the meaning of the terms: automatic—there is no interrogation needed to start the data or squitter coming from the transponder; dependent—as it relies on onboard navigation and broadcast equipment to provide information to other ADS-B users;

and surveillance—it is a means of automatic surveillance and traffic coordination. Some of the benefits of ADS-B technology are better use of airspace, improved aircraft-on-ground surveillance and better safety for traffic avoidance and conflict management.


How Does ADS-B Work?
The aircraft get their position from the GNSS constellation
Mode –ES uses TCAS
Air-To-Air is part of UAT
Then they simultaneously broadcast their position and other data to any aircraft, or ground station equipped to receive it
Ground Stations then transmit the aircraft's position to Air Traffic Control



- One of the most important investments in safety is the development of ADS-B.
- A key NextGen foundational technology, ADS-B enables air traffic controllers to track aircraft with greater accuracy and reliability than radar while giving pilots more information in the cockpit.
- It's the next generation of seeing and separating aircraft.
- ADS-B uses GPS technology to determine an aircraft's location (and other information, such as airspeed), and broadcasts that information to controllers and other equipped aircraft via a nationwide network of ground stations.
- ADS-B provides surveillance where radar can not be deployed, such as remote areas of Alaska and the Gulf of Mexico, where ADS-B radio stations are mounted on oil platforms.
- ADS-B also enables aircraft-to-aircraft surveillance.

Benefits

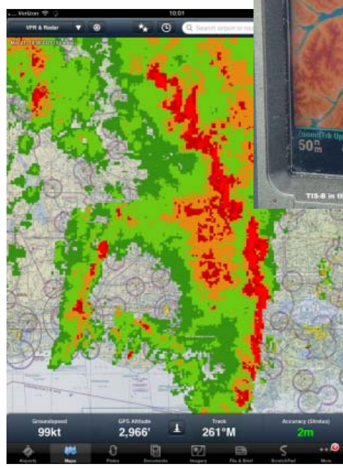
- Provides more frequent position update-rates than radar = precise location information of aircraft. With the upgraded surveillance and broadcast system and aircraft equipped with ADS-B Out transponders, aircraft positions on controller screens update almost continuously, compared to every 4.7 seconds or longer with radar.
- Provides in-cockpit traffic and weather information
- Improves safety for pilots
- Last month [March 2014], the FAA accomplished a major milestone: we successfully completed the baseline installation of the ADS-B's nationwide ground infrastructure.
- This is a big step forward as we transition to a satellite-based air traffic system.
- Of the 230 air traffic facilities across the country, 102 are currently using ADS-B to separate traffic. It is expected to be connected and operating at all 230 facilities by 2019.
- In addition to the operational benefits of ADS-B, each one of the 634 ground stations is substantially smaller than a radar installation, resulting in less impact to the environment and less cost to maintain.

Moving forward

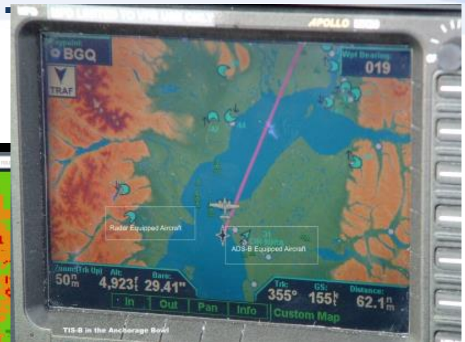
- We're working to expand ADS-B in places like Alaska, the Gulf of Mexico and the Caribbean.
- Surveillance coverage available
    - En Route by 2015
    - Terminal and Surface by 2019
- Reduced separation
- Oceanic in-trail altitude changes

Traffic and Weather Information Are Available

- Equipped pilots can now see other aircraft
- Get free live weather data
- Receive NOTAMS, METARs and TAFs



Flight Information Services – Broadcast (FIS-B)



Traffic Information Services – Broadcast (TIS-B)

FAA NextGEN

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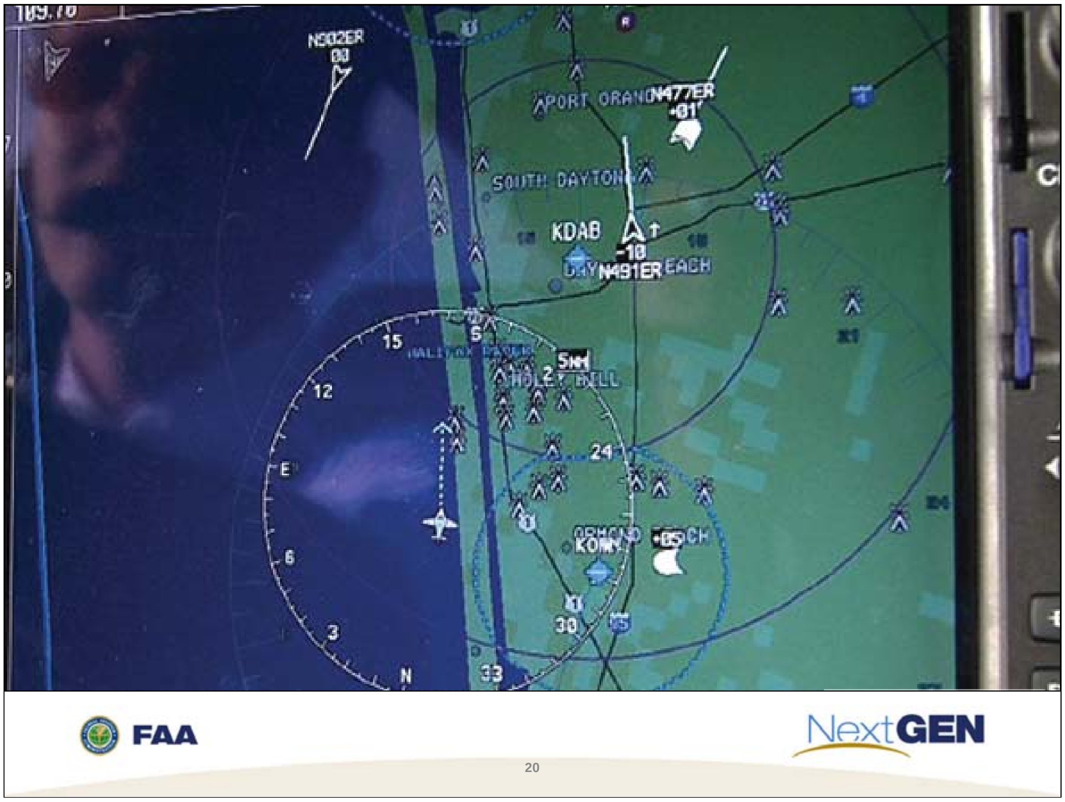
- NOTAM = Notices to Airmen
- METAR = Meteorological Terminal Aviation Routine Weather Report
- TAF = Terminal Area Forecast



- TSAA is an application that directly benefits GA pilots who equip with ADS-B In.
- We designed this traffic alerting application specifically to minimize nuisance alerts for GA traffic patterns, something that existing systems have issues with.
- The Minimum Operational Performance Standards (MOPS) for this application were approved last month.
- Next step is to develop the technical standards order.
- ADS-B in is equipment needed in the aircraft to receive the information. (more on this in subsequent slides)

INDUSTRY STANDARDS

"1090 ES"

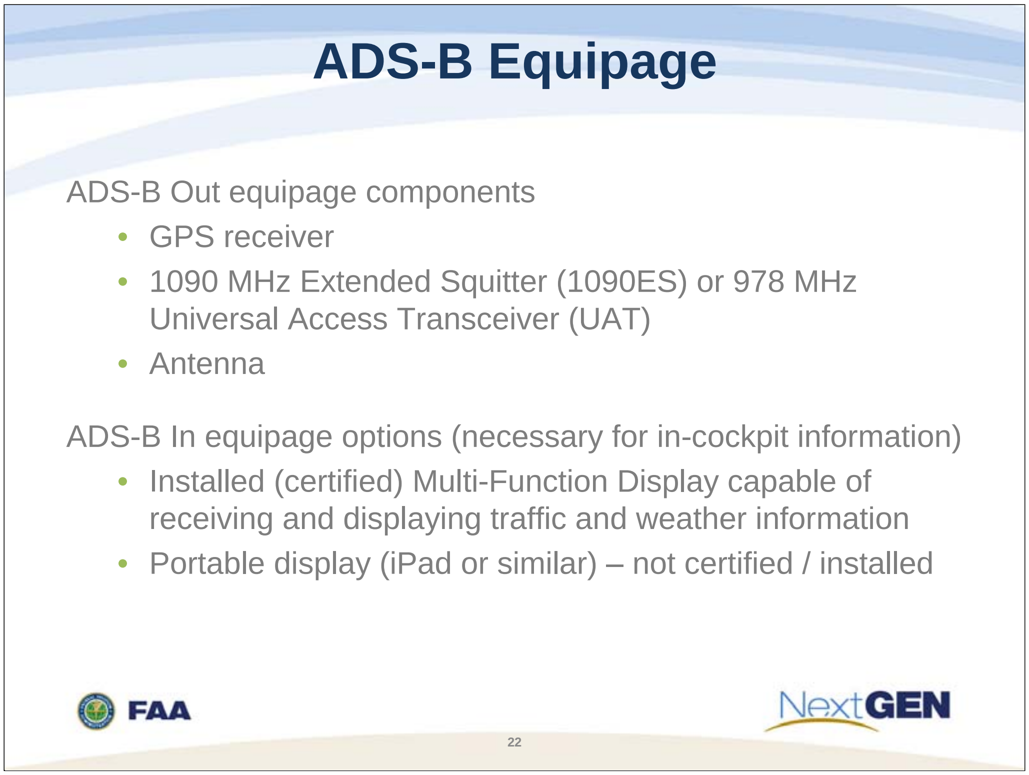
1090/1030 Mhz Mode-S

- 1090 Mhz Extended Squitter datalink
- Mode-S based system
- Currently, only compatible with large aircraft avionics systems
- Cost > $150,000 USD per installation

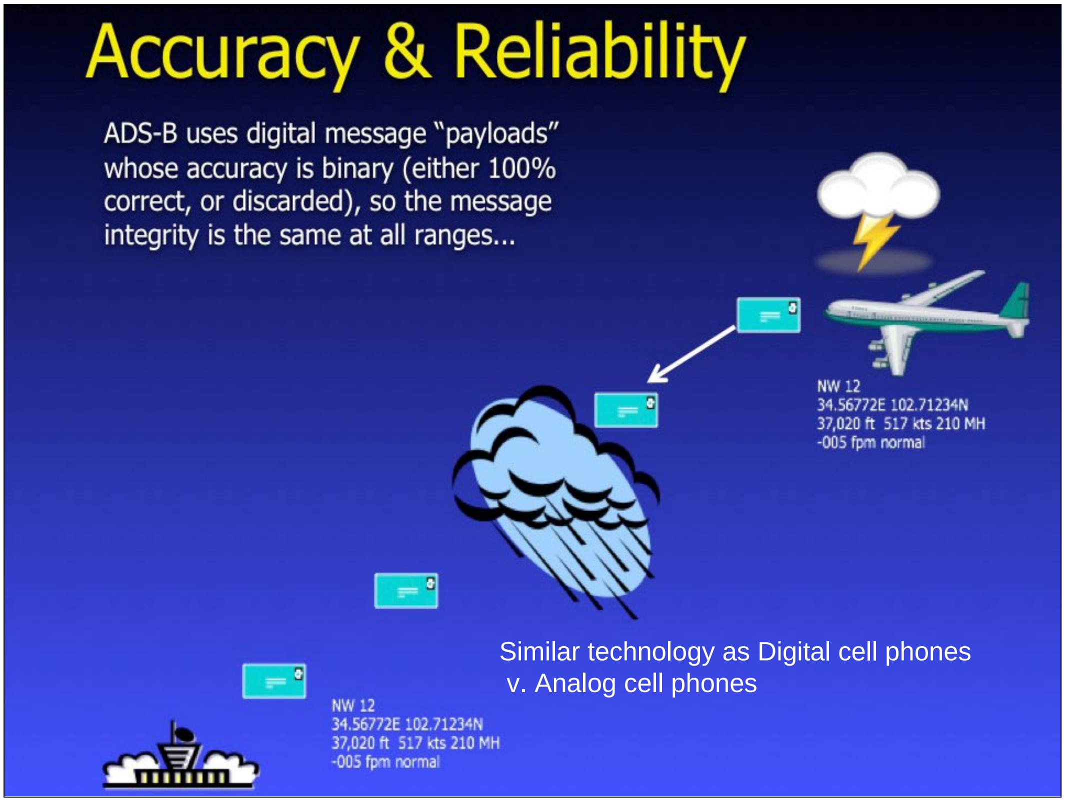
"UAT"

Universal Access Transceiver

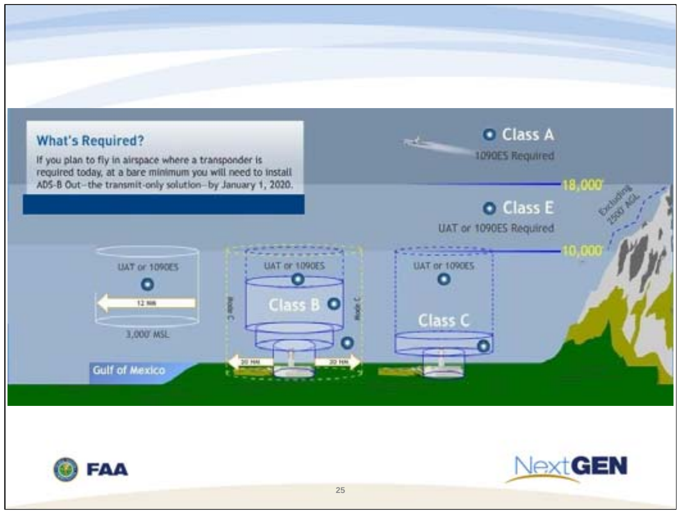
- 978 Mhz datalink
- Current standard for smaller aircraft
- Light weight
- Relatively simple interfaces
- Cost ~ $15,000 USD per avionics installation



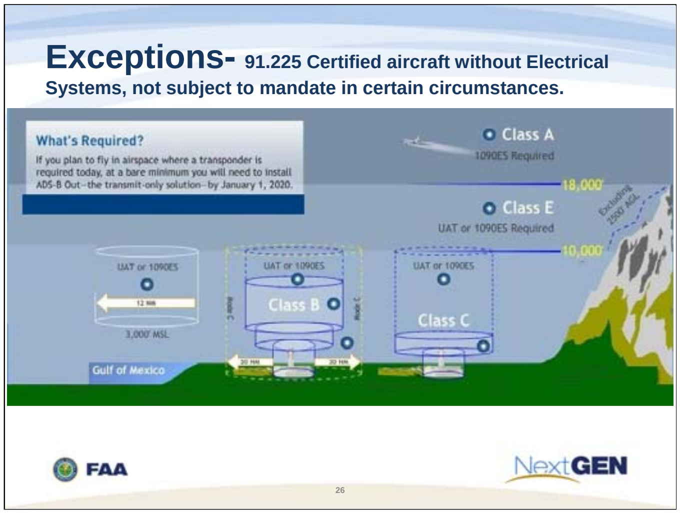
- To be compliant with the ADS-B Out equipage rule, GA aircraft need an entire system, which includes the GPS, the ADS-B transmitter (either UAT or 1090 MHz Extended Squitter [1090ES]) and the antennas for both the GPS and the ADS-B equipment.
- Operators flying above FL180 MUST equip with 1090ES ADS-B Out.
- The Rule also allows an operator to have ADS-B Out on 1090ES (or UAT) and have a "dual-link" ADS-B-In receiver (receives on both UAT and 1090ES links) -- this is a popular choice based on our current equipage statistics, and is really the best choice for higher-end GA aircraft that fly above FL180 and yet still want to receive FIS-B (which is only available on UAT).
- A multi-function display IS NOT required for ADS-B Out. A display IS necessary to show traffic, weather and other aeronautical information on ADS-B In.
- ADS-B Out Avionics currently approved by the FAA retail for $2,500 - $6,000. Costs are going to vary by the kind of equipment an operator gets and what benefits that equipment provides. Installation costs are additional and will vary based on the kind of aircraft category and the extent of installed equipment.
- A small GA aircraft might only require a transponder upgrade taking as few as 8 hours to install. Many GA aircraft require not only a transponder but also a position source resulting in 40 hours. While at the same time, some installations in a business jet can take much longer, depending on the avionics configuration.


Accuracy & Reliability
ADS-B uses digital message "payloads" whose accuracy is binary (either 100% correct, or discarded), so the message integrity is the same at all ranges...
NW 12
34.56772E 102.71234N
37,020 ft 517 kts 210 MH
-005 fpm normal
Similar technology as Digital cell phones
v. Analog cell phones
NW 12
34.56772E 102.71234N
37,020 ft 517 kts 210 MH
-005 fpm normal

1. Class A, B and C airspace is affected by the ADS-B Out equipage requirement. So is Class E airspace within the 48 contiguous states and the District of Columbia at and above 10,000 feet MSL.
2. You do not need to ADS-B out to fly in Class E airspace below 2,500 feet.
3. Rule of thumb: for most of the places that you need a Mode C transponder today you will need ADS-B Out.
4. You will also need ADS-B Out to operate in Class E airspace at and above 3,000 feet MSL over the Gulf of Mexico from the coastline of the United States out to 12 nautical miles.
5. The ADS-B Out rule does not apply in the airspace defined in items 1 and 2 above for any aircraft that was not originally certificated with an electrical system or that has not subsequently been certified with such a system installed, including balloons and gliders.



- Class A airspace: generally, from 18,000 feet MSL up to and including FL 600, including the airspace overlying the waters within 12 nautical miles of the coast of the 48 contiguous States and Alaska. Unless otherwise authorized, all persons must operate their aircraft under IFR.
- Class B airspace: generally, from the surface to 10,000 feet mean sea level (MSL) surrounding the nation's busiest airports in terms of airport operations or passenger enplanements. The configuration of each Class B airspace area is individually tailored and consists of a surface area and two or more layers, and is designed to contain all published instrument procedures. An ATC clearance is required for all aircraft to operate in the area, and all aircraft that are so cleared receive separation services within the airspace. The cloud clearance requirement for VFR operations is “clear of clouds.“
- Class C airspace: generally, from the surface to 4,000 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational control tower, are serviced by a radar approach control, and that have a certain number of IFR operations or passenger enplanements. Although the configuration of each Class C area is individually tailored, the airspace usually consists of a surface area with a 5 NM radius, an outer circle with a 10 NM radius that extends from no lower than 1,200 feet up to 4,000 feet above the airport elevation. Each person must establish two-way radio communications with the ATC facility providing air traffic services prior to entering the airspace and thereafter maintain those communications while within the airspace.
- Class E airspace: generally, if the airspace is not Class A, Class B, Class C, or Class D, and it is controlled airspace, it is Class E airspace.
- Class D airspace, which does not require ADS-B: generally, from the surface to 2,500 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational control tower.
  The configuration of each Class D airspace area is individually tailored and when instrument procedures are published, the airspace will normally be designed to contain the procedures. Arrival extensions for instrument approach procedures may be Class D or Class E airspace. Unless otherwise authorized, each person must establish two-way radio communications with the ATC facility providing air traffic services prior to entering the airspace and thereafter maintain those communications while in the airspace. No separation services are provided to VFR aircraft.



91.115 (e) The requirements of paragraph (b) of this section do not apply to any aircraft that was not originally certificated with an electrical system, or that has not subsequently been certified with such a system installed, including balloons and gliders. These aircraft may conduct operations without ADS-B Out in the airspace specified in paragraphs (d)(2) and (d)(4) of this section. Operations authorized by this section must be conducted--

(1) Outside any Class B or Class C airspace area; and

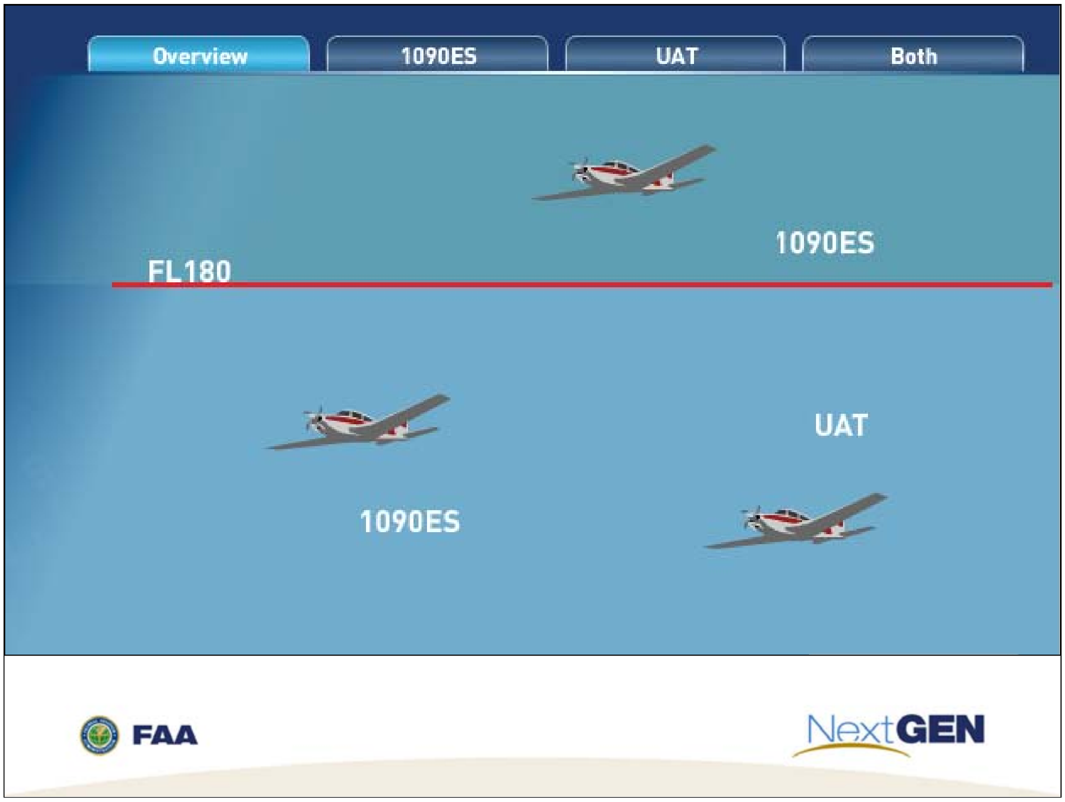
(2) Below the altitude of the ceiling of a Class B or Class C airspace area designated for an airport, or 10,000 feet MSL, whichever is lower.

(f) Each person operating an aircraft equipped with ADS-B Out must operate this equipment in the transmit mode at all times.

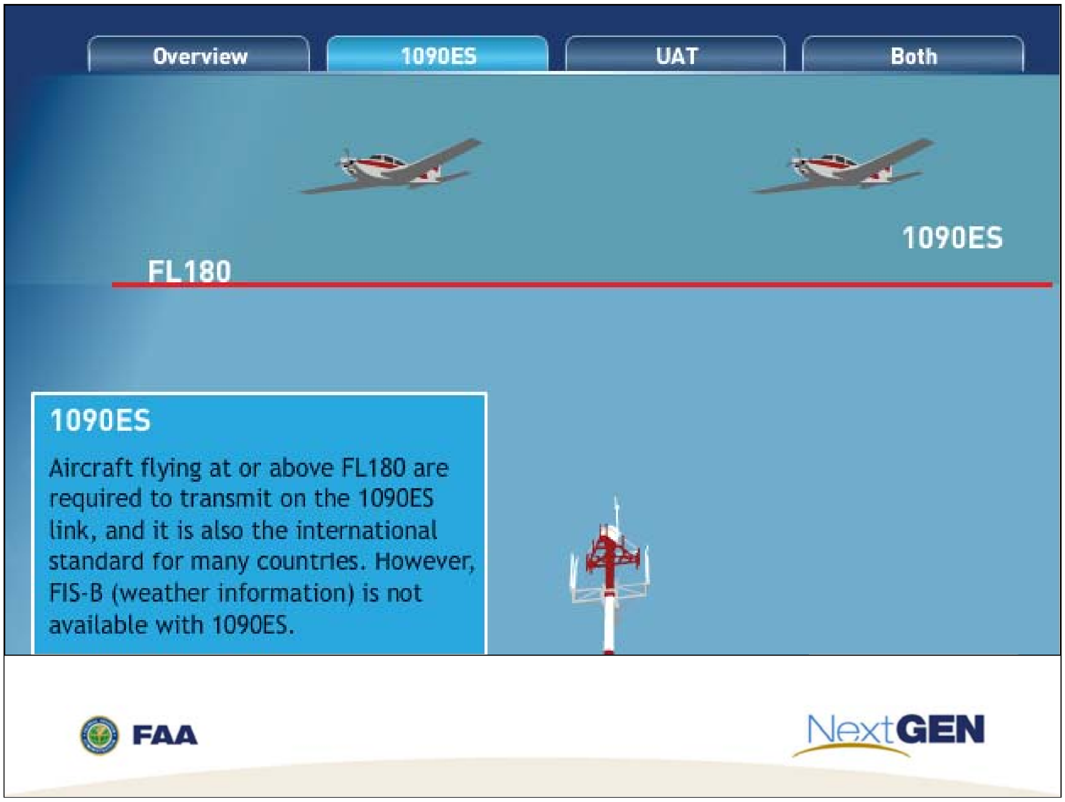
(g) Requests for ATC authorized deviations from the requirements of this section must be made to the ATC facility having jurisdiction over the concerned airspace within the time periods specified as follows:

(1) For operation of an aircraft with an inoperative ADS-B Out, to the airport of ultimate destination, including any intermediate stops, or to proceed to a place where suitable repairs can be made or both, the request may be made at any time.

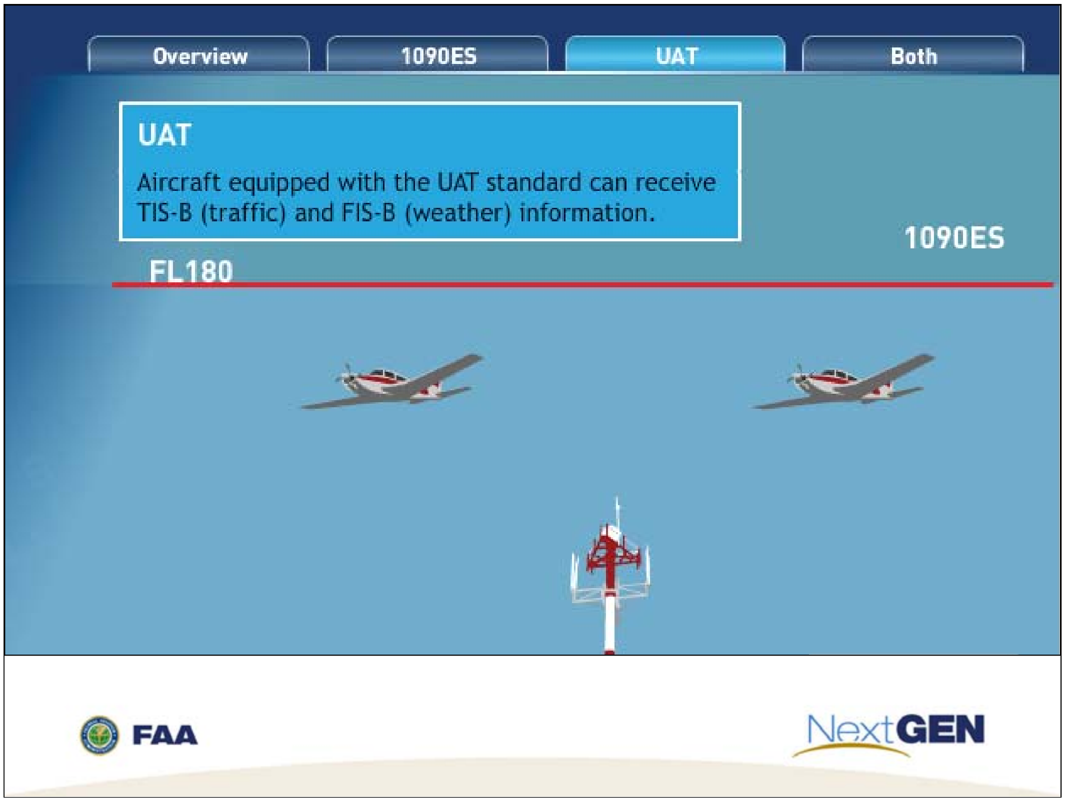
(2) For operation of an aircraft that is not equipped with ADS-B Out, the request must be made at least 1 hour before the proposed operation.



Above and Below FL180

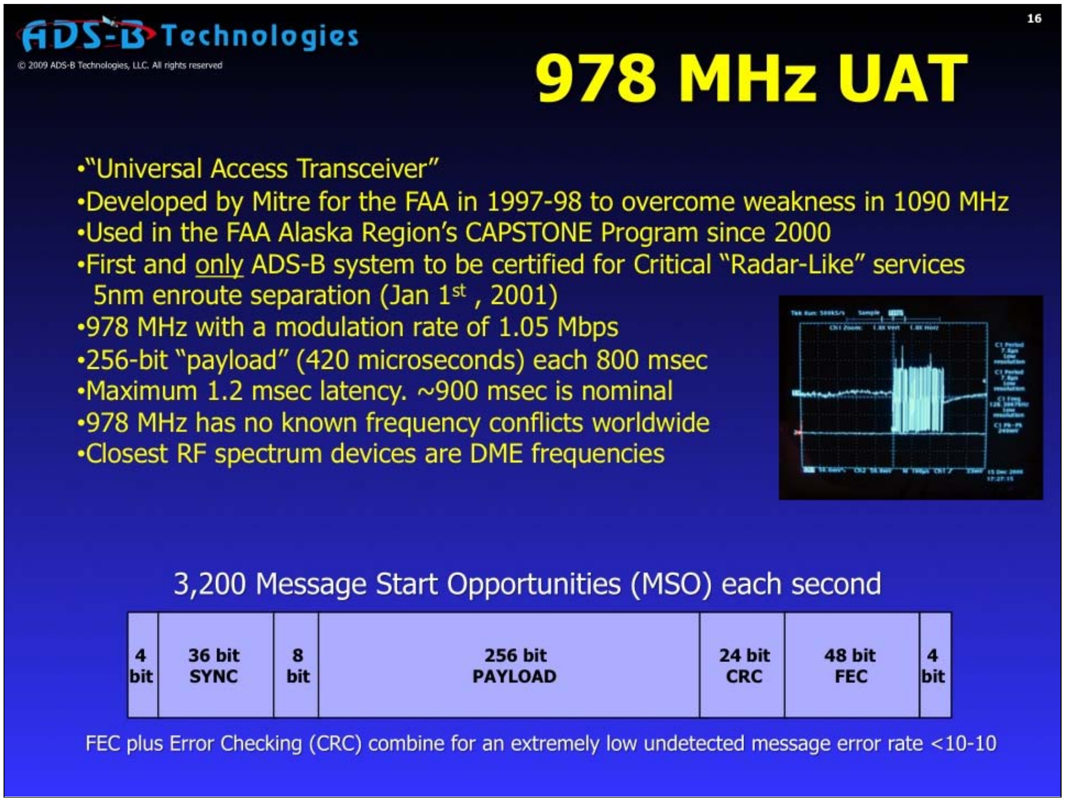

Overview
1090ES
UAT
Both
1090ES
FL180
1090ES
Aircraft flying at or above FL180 are required to transmit on the 1090ES link, and it is also the international standard for many countries. However, FIS-B (weather information) is not available with 1090ES.
FAA
NextGEN

1090ES

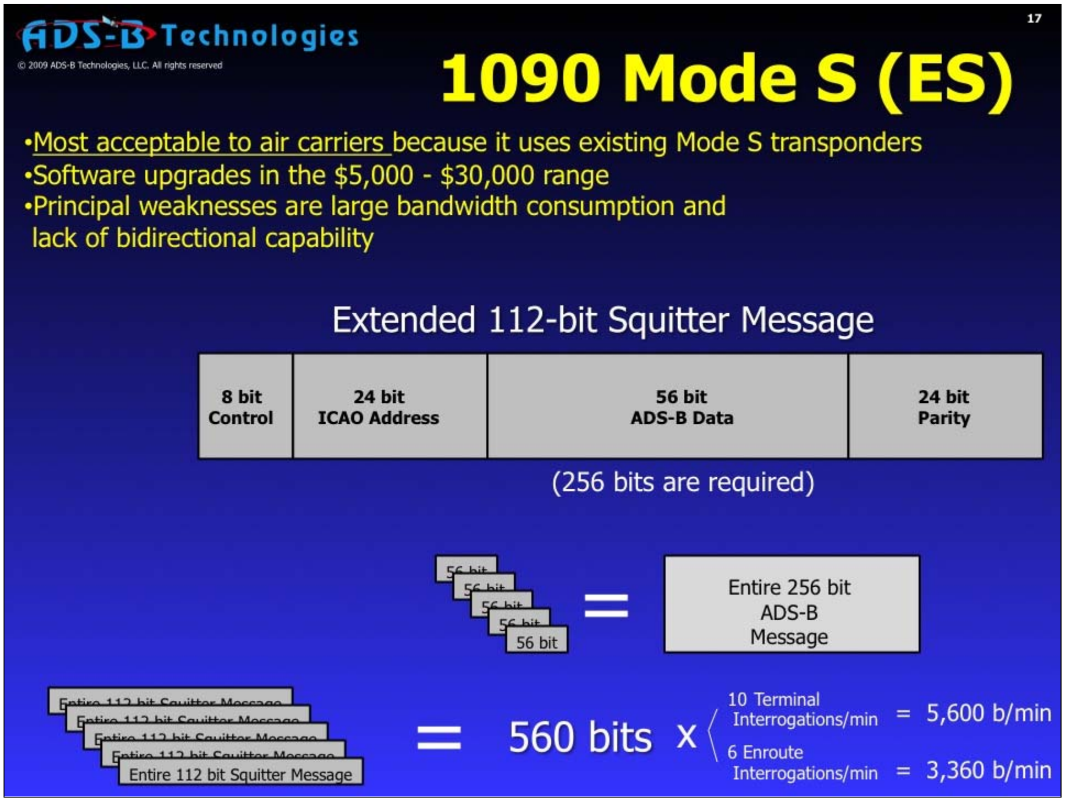

Overview
1090ES
UAT
Both
UAT
Aircraft equipped with the UAT standard can receive TIS-B (traffic) and FIS-B (weather) information.
1090ES
FL180
FAA
NextGEN

UAT

Hybrid 1090 and 978 (UAT)

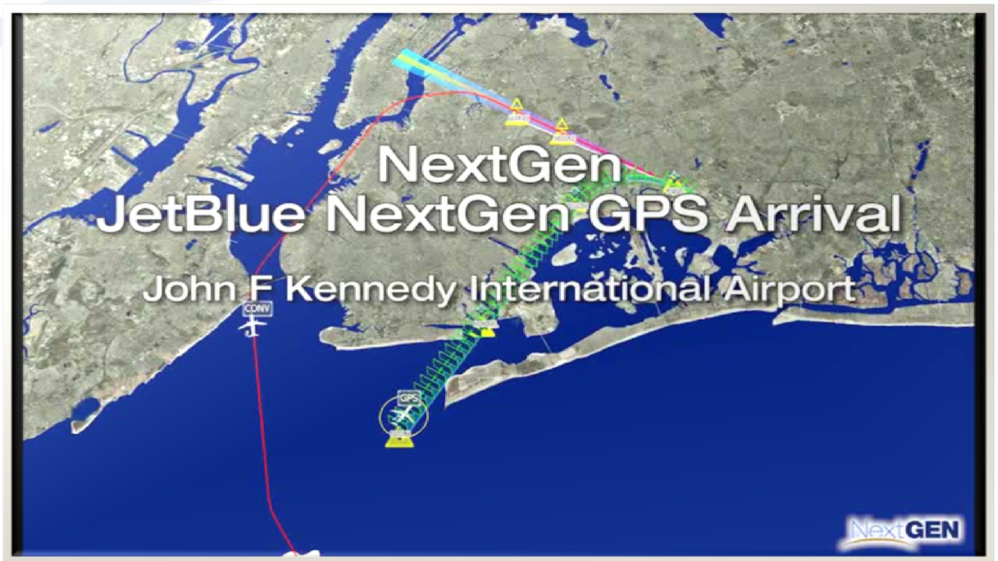


What is 978 UAT?



What is 1090 ES?

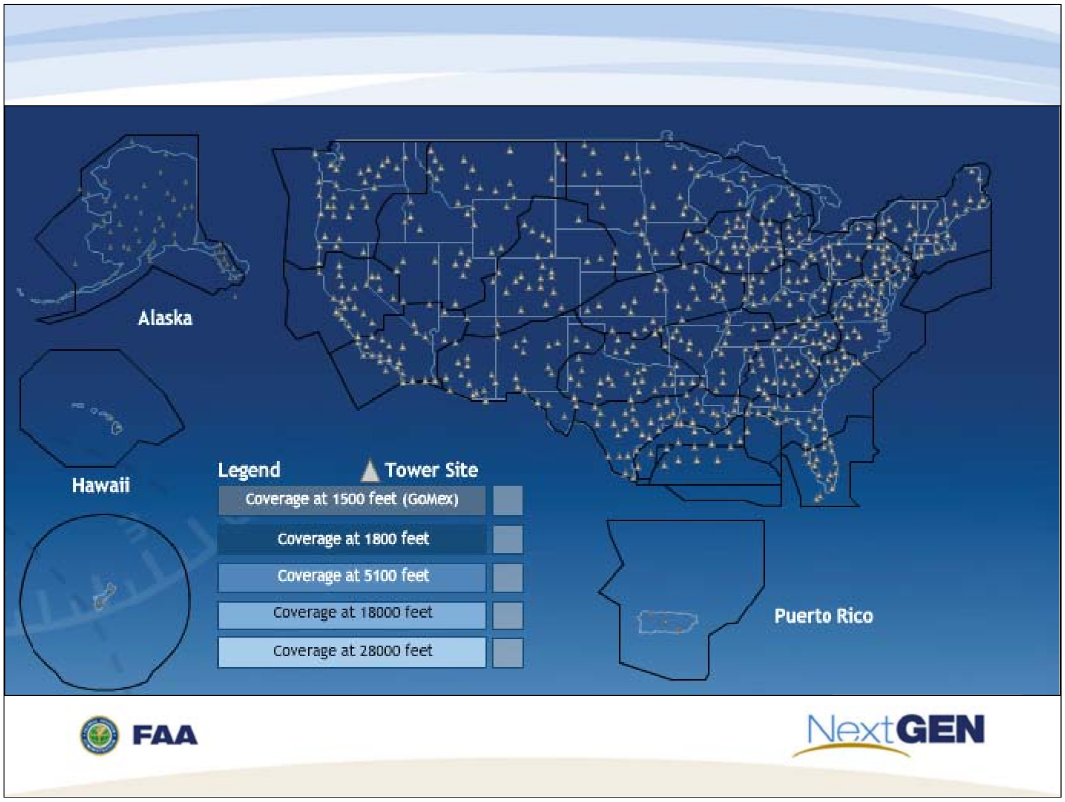
NextGen Arrivals to JFK

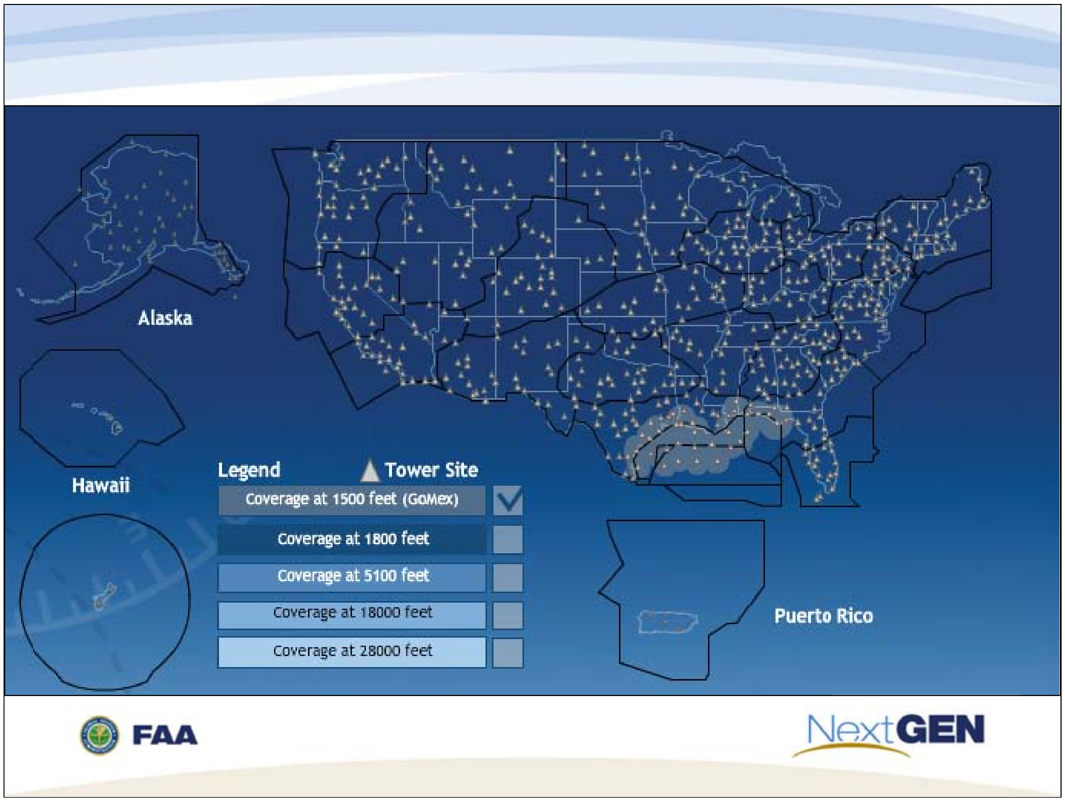


33

By creating a new road – we create new access. Here is an example of where NextGen is making a difference today at JFK.

Precision navigation allows planes to fly on idle descent and on tighter flight paths – creating more options and creating more flexible airspace


Alaska
Hawaii
Puerto Rico
Legend
Tower Site
Coverage at 1500 feet (GoMex)
Coverage at 1800 feet
Coverage at 5100 feet
Coverage at 18000 feet
Coverage at 28000 feet
FAA
NextGEN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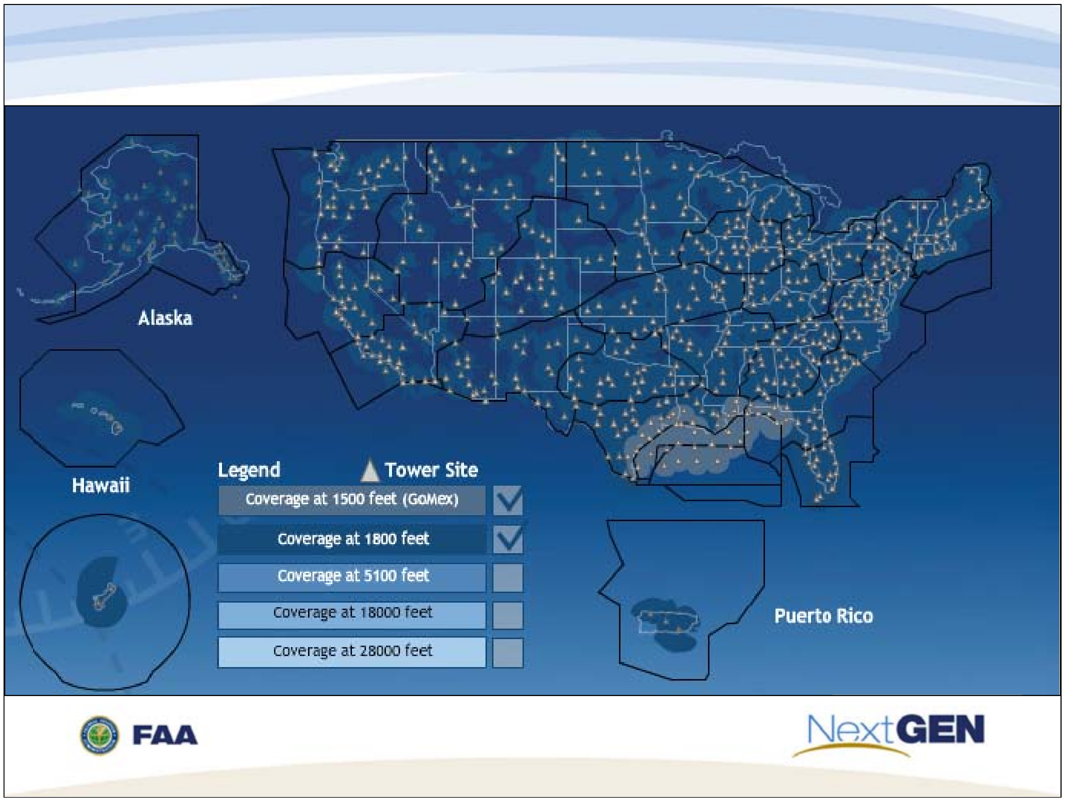
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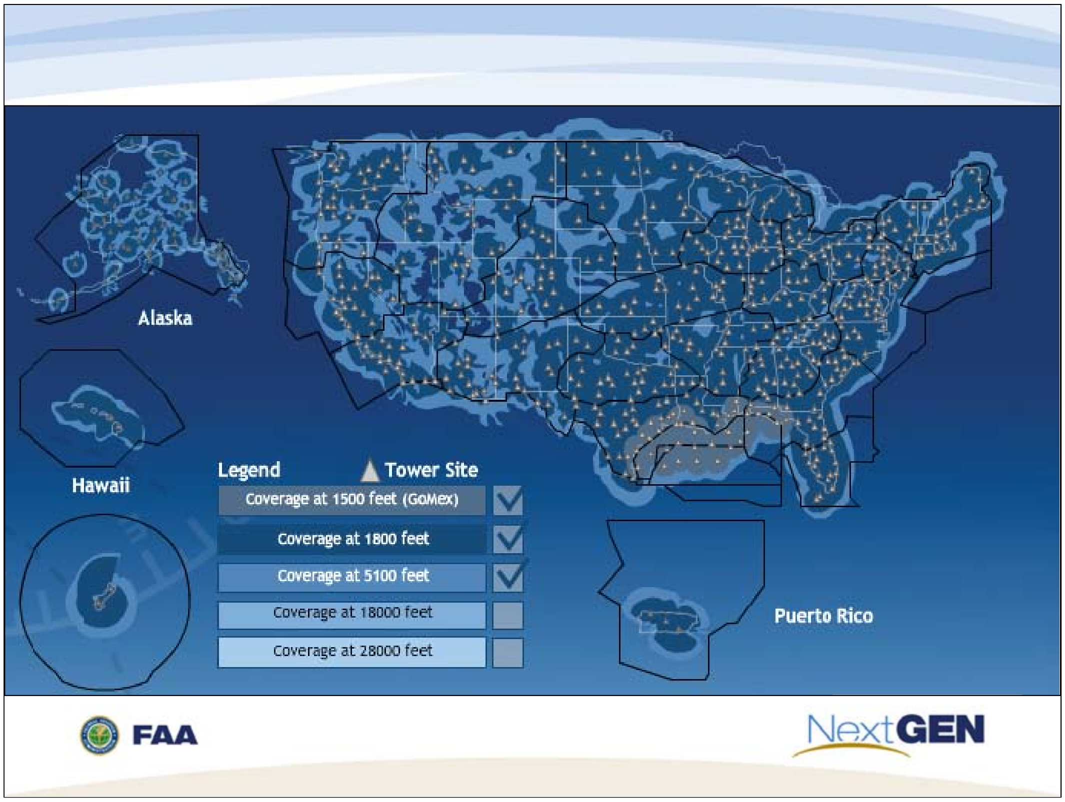
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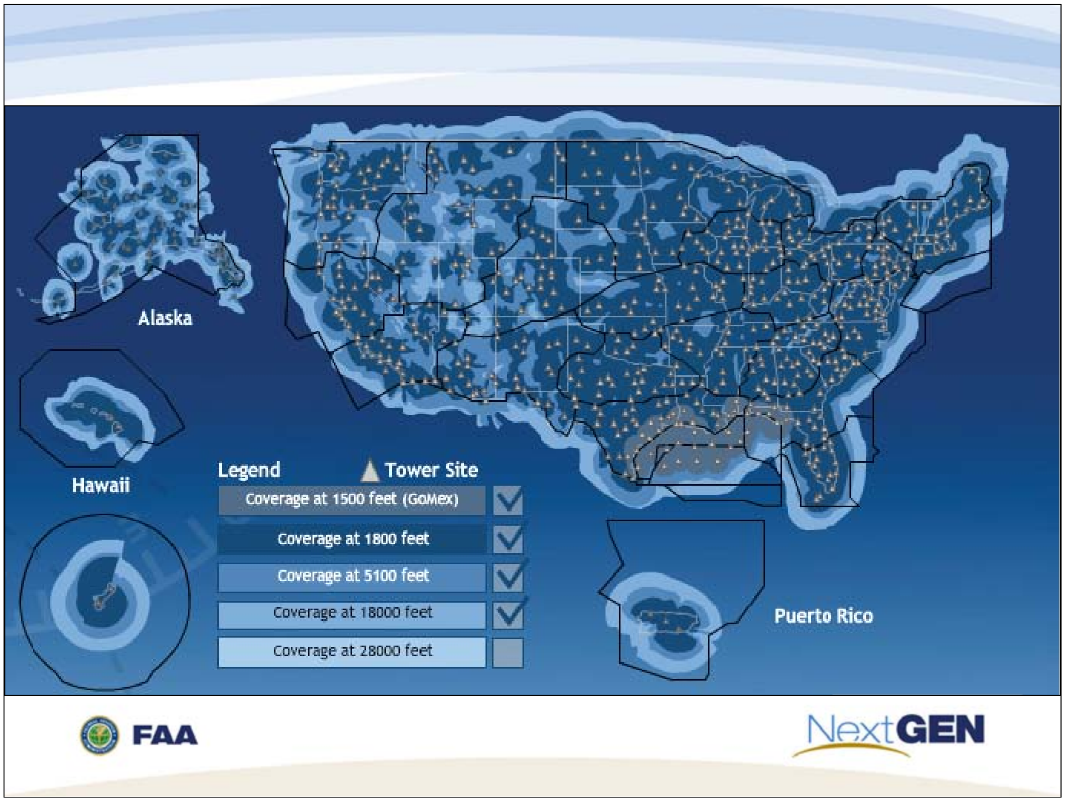
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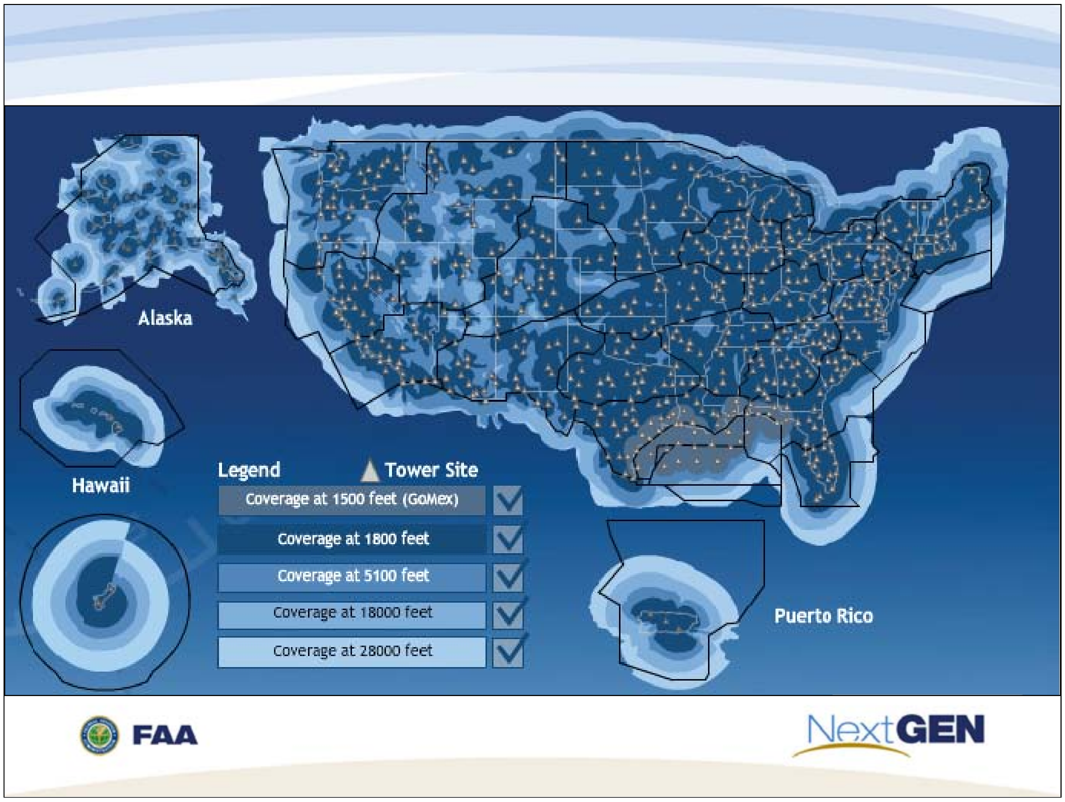
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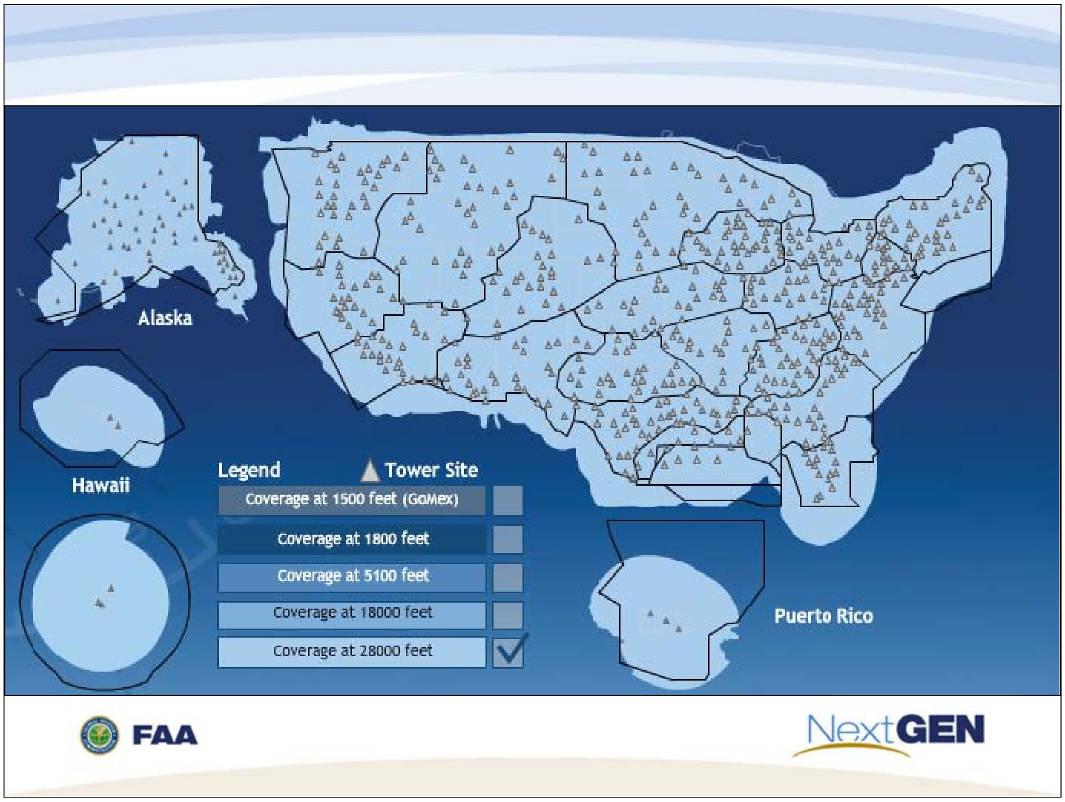
FAA
NextGEN



Another way of looking at coverage above 28000 feet.

Currently Not Mandated

ADS-B In

Pros

- You can see other traffic (ADS-B and, if you are within line-of-sight of a ground station, non-ADS-B transponder-equipped traffic).
- If you choose a UAT solution, you can receive FIS-B services.

Cons

- It is more costly than just ADS-B-Out (since you will need to add a receiver and a display, and not all Multi-Function Displays (MFD) are ADS-B compatible).

The Fine Print

Keep in mind that traffic and weather displays are for situational awareness only. Having an in-cockpit display of traffic does not relieve you of visually seeing and avoiding other aircraft or obstructions, and it is not to be used as the sole means for maneuvering to avoid other aircraft. That said, research has shown that visual acquisition of traffic is significantly improved with a traffic information service such as TIS-B.

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Why is this important to you?

By January 1, 2020, you will need to have installed ADS-B Out equipment to fly in airspace that currently requires a transponder.

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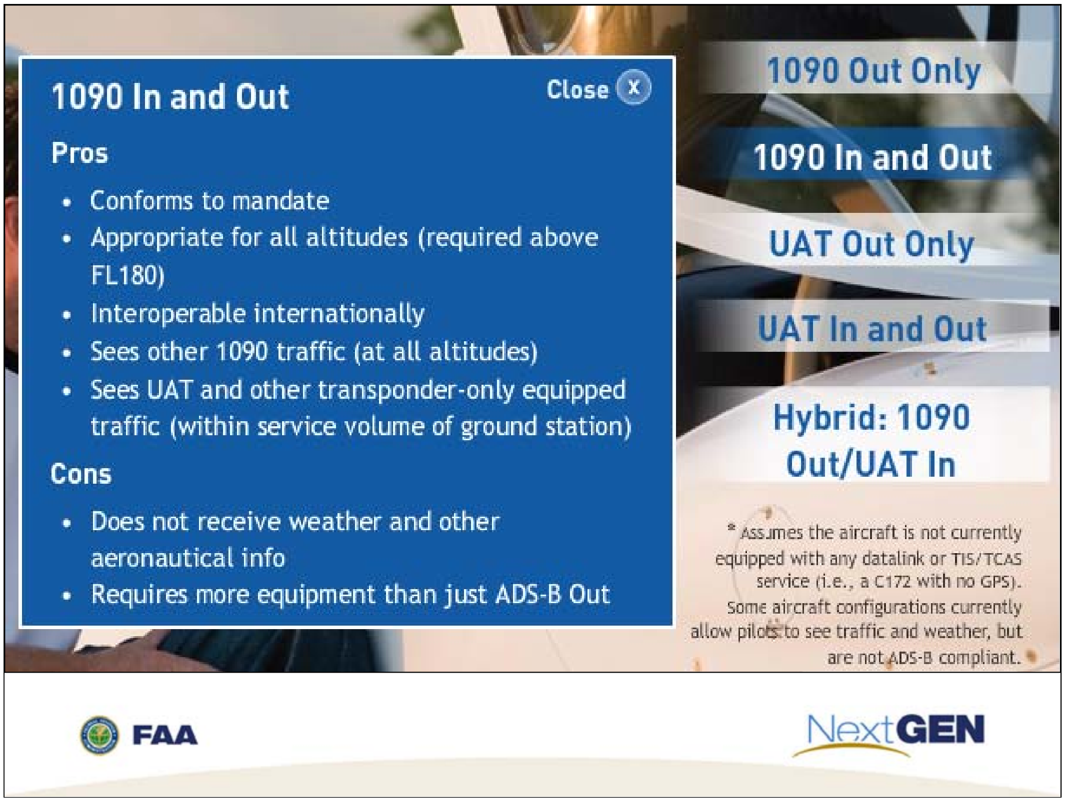
1090 Out Only
Close X
Pros
Conforms to mandate
Appropriate for all altitudes (required above FL180)
Interoperable internationally
Cons
Does not see traffic
Does not receive weather and other aeronautical info
1090 Out Only
1090 In and Out
UAT Out Only
UAT In and Out
Hybrid: 1090 Out/UAT In
* Assumes the aircraft is not currently equipped with any datalink or TIS/TCAS service (i.e., a C172 with no GPS). Some aircraft configurations currently allow pilots to see traffic and weather, but are not ADS-B compliant.
FAA
NextGEN


1090 In and Out
Close X
Pros
• Conforms to mandate
• Appropriate for all altitudes (required above FL180)
• Interoperable internationally
• Sees other 1090 traffic (at all altitudes)
• Sees UAT and other transponder-only equipped traffic (within service volume of ground station)
Cons
• Does not receive weather and other aeronautical info
• Requires more equipment than just ADS-B Out
1090 Out Only
1090 In and Out
UAT Out Only
UAT In and Out
Hybrid: 1090 Out/UAT In
* Assumes the aircraft is not currently equipped with any datalink or TIS/TCAS service (i.e., a C172 with no GPS). Some aircraft configurations currently allow pilots to see traffic and weather, but are not ADS-B compliant.
FAA
NextGEN


UAT Out Only
Close X
Pros
• Conforms to mandate
Cons
• Does not see traffic
• Does not receive weather and other aeronautical info
• Does not meet MOST international ADS-B standards
• Not authorized above FL180
1090 Out Only
1090 In and Out
UAT Out Only
UAT In and Out
Hybrid: 1090 Out/UAT In
* Assumes the aircraft is not currently equipped with any datalink or TIS/TCAS service (i.e., a C172 with no GPS). Some aircraft configurations currently allow pilots to see traffic and weather, but are not ADS-B compliant.
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UAT In and Out

Close X

Pros

- Conforms to mandate
- Sees other UAT traffic (at all altitudes)
- Sees 1090 and other transponder-only equipped traffic (within service volume of ground station)
- Receives free weather information (within service volume of ground station)
- Receives free aeronautical information (within service volume of ground station)

Cons

- Requires more equipment than just ADS-B Out
- Services (FIS-B and TIS-B) limited above FL180
- Does not meet MOST international ADS-B standards
- Not authorized above FL180

1090 Out Only

1090 In and Out

UAT Out Only

UAT In and Out

Hybrid: 1090 Out/UAT In

* Assumes the aircraft is not currently equipped with any datalink or TIS/TCAS service (i.e., a C172 with no GPS). Some aircraft configurations currently allow pilots to see traffic and weather, but are not ADS-B compliant.

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Hybrid: 1090 Out/UAT In

Close X

Pros

- Conforms to mandate
- Appropriate for all altitudes
- Interoperable internationally
- Sees other UAT traffic (at all altitudes)
- Sees 1090 and other transponder-only equipped traffic (within service volume of ground station)
- Receives free weather information (within service volume of ground station)
- Receives free aeronautical information (within service volume of ground station)

Cons

- Services (FIS-B and TIS-B) limited above FL180
- Requires more equipment than just ADS-B Out

1090 Out Only

1090 In and Out

UAT Out Only

UAT In and Out

Hybrid: 1090 Out/UAT In

* Assumes the aircraft is not currently equipped with any datalink or TIS/TCAS service (i.e., a C172 with no GPS). Some aircraft configurations currently allow pilots to see traffic and weather, but are not ADS-B compliant.

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Some implementations may be as simple as a software update to your existing equipment.

Others may be an “all-in-one” solution that won’t add too much in terms of real estate to your panel. The main point is: Research Your Options!

Next Steps:
DECIDE

- Should you implement just what is mandated? (ADS-B Out), or a solution that gives you both ADS-B In and ADS-B Out capability?
- Which data link frequency do you want (1090ES or UAT)?
- Will a hybrid (1090ES Out and UAT In) solution work for you based upon where you fly?
- Is any of your existing equipment compatible with the ADS-B requirements?

FAA NextGEN

Should you implement just what is mandated? (ADS-B Out), or a solution that gives you both ADS-B In and ADS-B Out capability?

Which data link frequency do you want (1090ES or UAT)?

Will a hybrid (1090ES Out and UAT In) solution work for you based upon where you fly?

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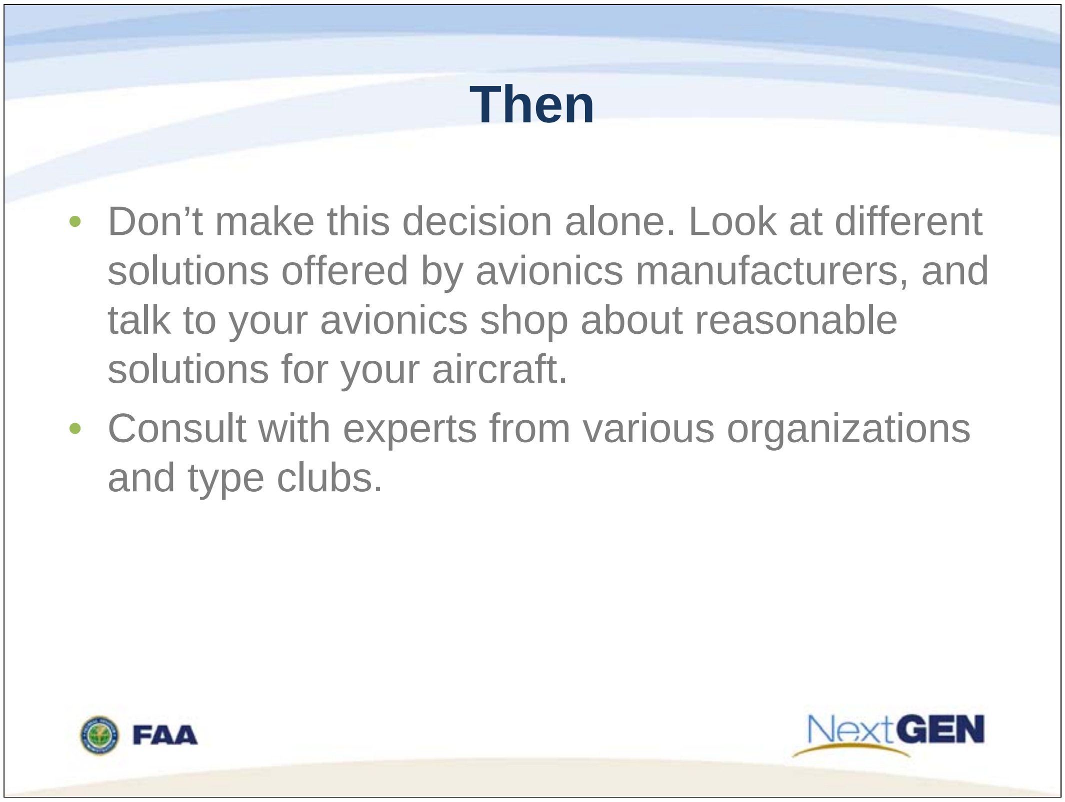
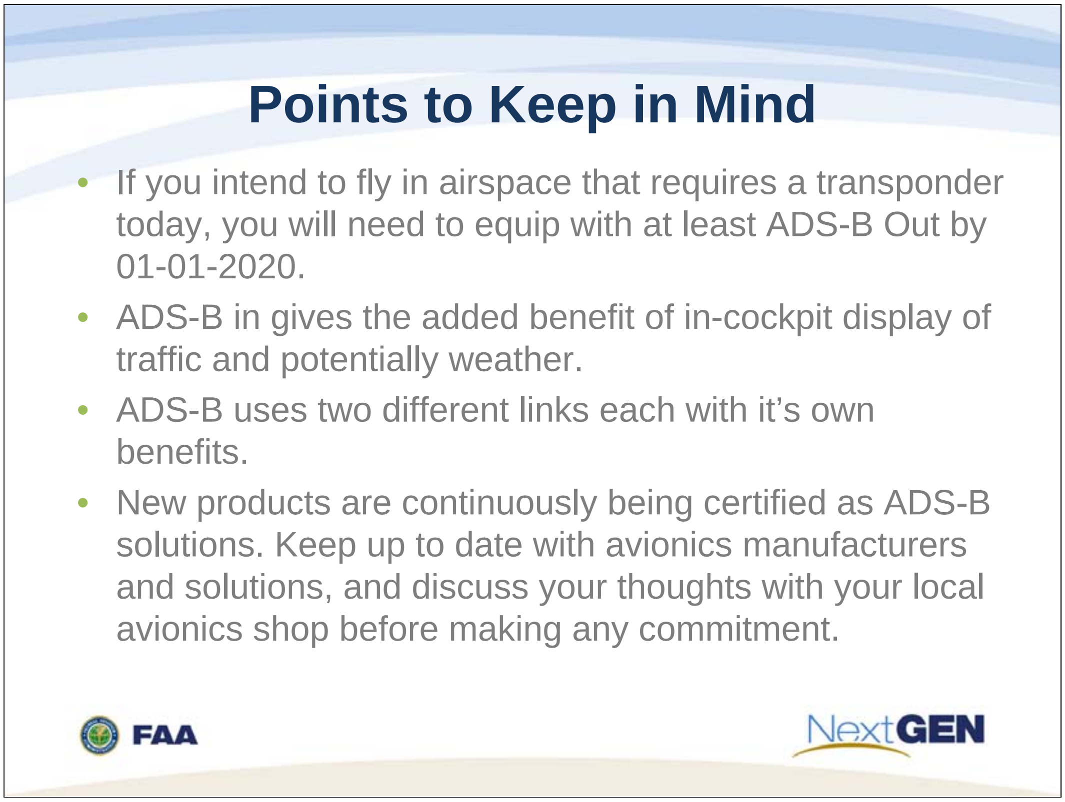


Don’t make this decision alone. Look at different solutions offered by avionics manufacturers, and talk to your avionics shop about reasonable solutions for your aircraft. Consult with experts from various organizations and type clubs.

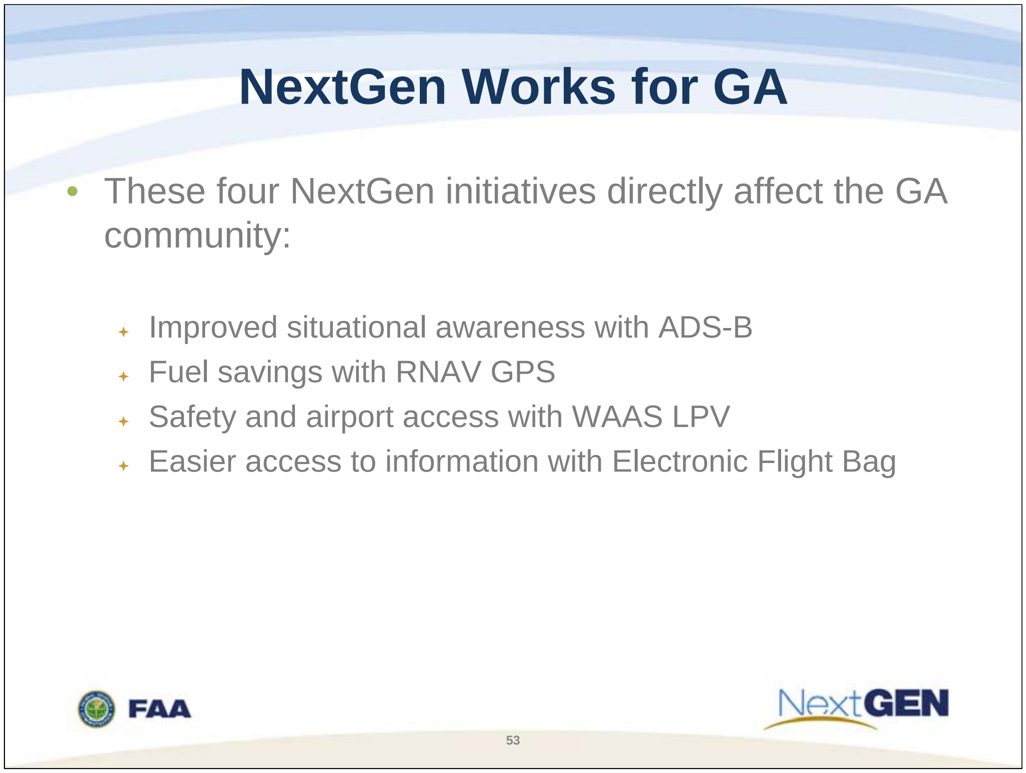


If you intend to fly in airspace that requires a transponder today, you will need to equip with at least ADS-B Out by 01-01-2020.

ADS-B in gives the added benefit of in-cockpit display of traffic and potentially weather.

ADS-B uses two different links each with it’s own benefits.

New products are continuously being certified as ADS-B solutions. Keep up to date with avionics manufacturers and solutions, and discuss your thoughts with your local avionics shop before making any commitment.



While safety is the greatest NextGen benefit for GA, NextGen provides other benefits as well:

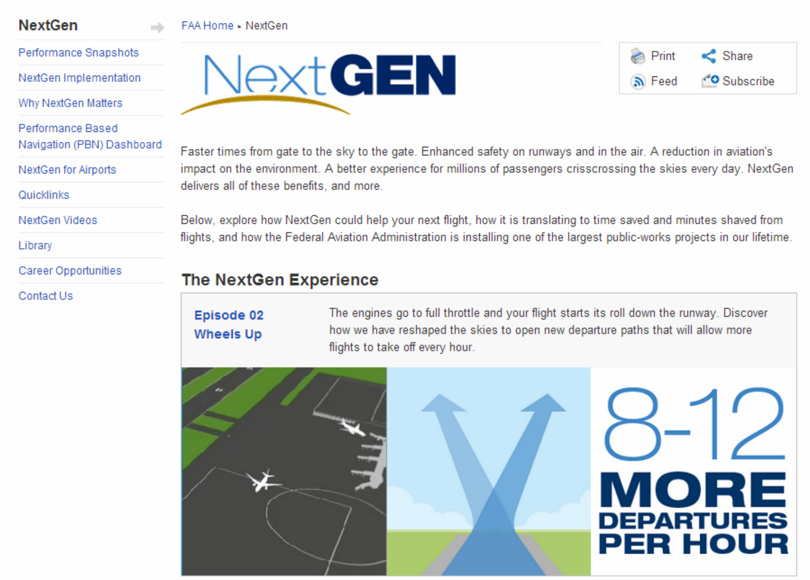
•improved situational awareness with ADS-B

•fuel savings with RNAV GPS

•airport access during low visibility conditions with WAAS LPV (see WAAS description on slide 8)

•easier access to information with electronic charts

Find Out More About How NextGen Works
www.faa.gov/nextgen



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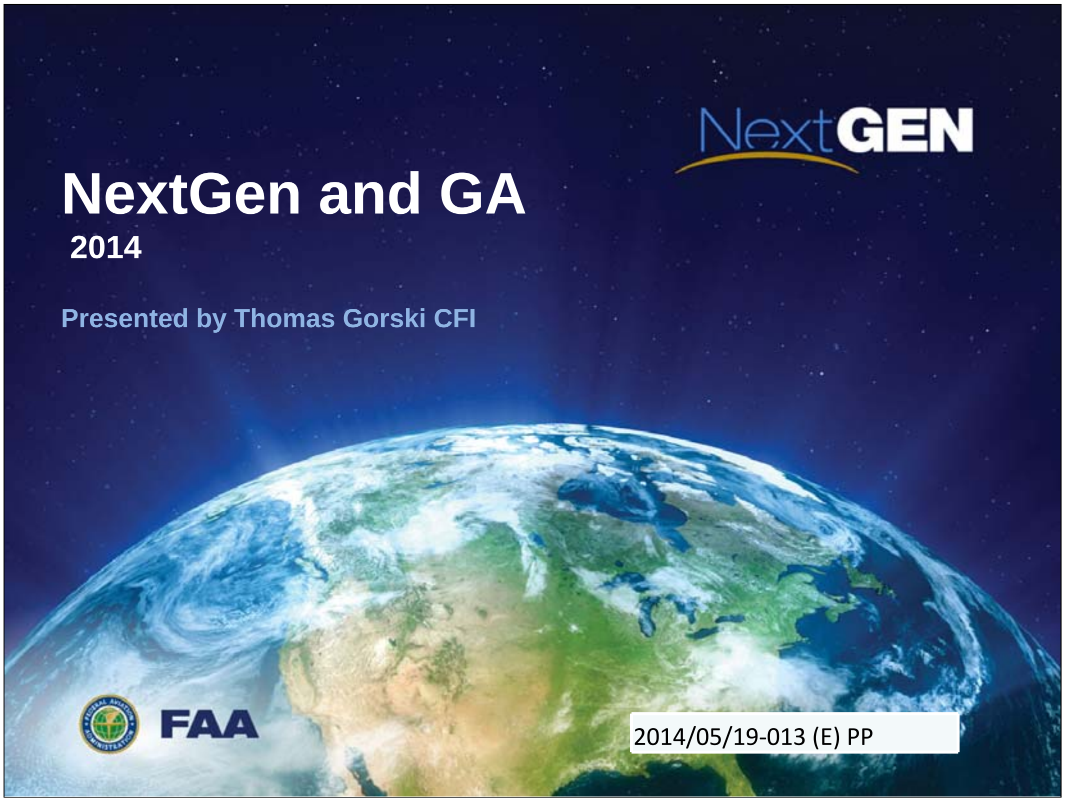
Find out more about how NextGen works on the FAA’s NextGen website.

Resources include:

•The NextGen Implementation Plan, an overview of the FAA's ongoing NextGen transition with timelines

•The 2014 update to the Plan will be available in several electronic formats, including eBooks

•The NexGen Performance Snapshots section, which reports on benefits and performance metrics, including site specific success stories



2014/06/17 POC Thomas Gorski, CFI phone: 503-551-1700

Original FAA Material: 2014/05/19-013 (E) PP POC Kevin Clover, AFS-850, phone: 562—888-2020

Break

15

Minutes Remaining

FAA NextGEN

Break

14

Minutes Remaining

Break

13

Minutes Remaining

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Minutes Remaining

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