

National Business Aircraft Association

Friends and Partners in Aviation Weather

November 3, 2016

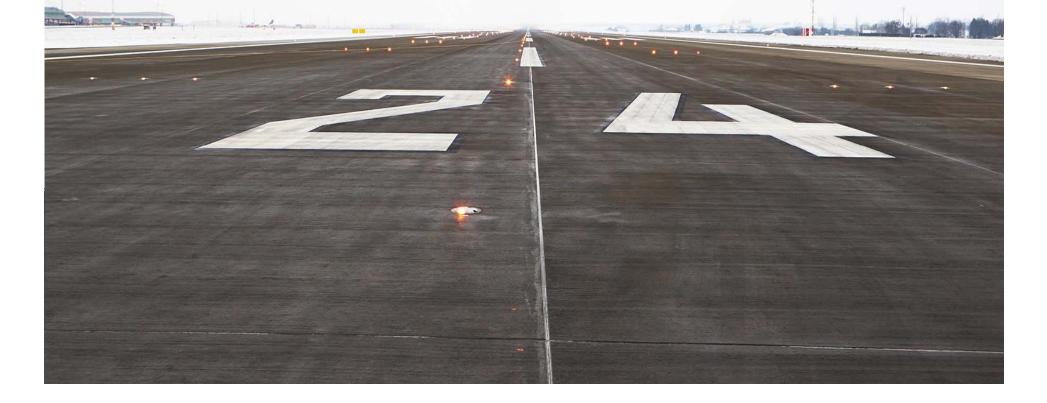




- > The Challenge of Surface Conditions
- > AST: A New Solution to a Global Aviation Problem
- > Benefits and Business Value to Airports and Operators



This is one of your greatest assets when its condition is measured accurately.



The Challenge of Surface Conditions



- Runway excursions are among the most-frequently reported accidents
 - o Do not often result in casualties, but still considered a threat to aviation safety
- Runway closures due to surface conditions
 - Airports can close runways at inopportune times
 - Substantive impacts on airline schedules, operations, costs (fuel and crew), customer satisfaction, etc.
- Payload and performance decrement decisions based on inaccurate data
 Assumptions can be made that are too conservative



Problem with current techniques



- Current means of measuring surface conditions can be inaccurate & misleading
 - Subjective not objective
 - Variable not data-based
- Pilots do a great job, yet PIREPS are inherently subjective assessments and can lead to unnecessary runway closures and operational impacts
- Conventional, outdated ground device measurements don't correlate to airplane braking capability or other ground devices
 Requires closure of runway to measure
- > Maintaining FICONs are a concern

METAR information quickly gets stale during winter conditions

New FAA Mandates



6

- > TALPA ARC recommendations have been incorporated into mandates
- Runway Condition Assessment Matrix (RCAM)
 - Based on human measurements of contaminant coverage, type and depth
 - This process carries it's own unique risk assessments
- > FICON reporting requirements are potentially burdensome
- Once the first PIREP is received, runway assessments then revert to pilots' subjective reporting
- > Airports are concerned about their ability to meet FAA's new requirements
 - Can the NOTAM system keep up?
 - What are adverse impacts and unintended consequences?



Perspectives & TALPA



> Pilots:

- Directional control operating thousands of pounds of machinery in slippery conditions
- Vital to know surface conditions and weather accurately and with timeliness

> Airports:

- New procedures
- Effect of shifting responsibilities and liabilities to airports could result in unexpected consequences



AST: Solving a Global Aviation Challenge

Surface Conditions: From Guesswork to KNOWLEDGE

OF TO

SafeLand[™] from AST



- > Utilizes landing aircraft as real-time runway condition measurement devices
 - AST uses real-time data downloaded directly from aircraft to run landing simulations and measure "Experienced Friction" as a function of the actual braking applied
 - Measured range is <u>from zero to the Friction Limit</u> (an aircraft calling for more deceleration without deceleration being delivered)
 - Reports presented in new TALPA nomenclature Good, Good to Medium, Medium, Medium to Poor, Poor, Nil
- Replaces subjective assessment with objective measurement



AST Unlocks the Data



> Data into Information

- Empirical measurements of surface conditions
- Real-time
- In context
- > Information into Knowledge
 - Reports that are understandable and actionable
 - Shared by both airlines and airports
- Knowledge into Impact
 - Better decision-making
 - Higher safety
 - Improved efficiency
 - Lower costs fuel, crew, etc.
 - Smarter scheduling and flight ops



The Power of Knowledge



- Helps airline carriers conform to FAA's new real-time surface friction reporting requirements
- Provides safety awareness benefits, reduces risk of runway excursions, and contributes to operational efficiencies
- Technology advances include friction forecasting, take-off performance decrement advisories, improved FICON-NOTAM processes
- Future enhancements include :90 min. Friction Forecasting
- 6 Prototype Airlines / 3 Prototype Airports
 - 2.5M+ Landings in dB
 - o 1,500 aircraft by Q1/2017





Operational Realities...



- > PIREPS only cover "used" portion of the landing runway
- Roll-out section of take-off runway is not reported, leading to sub-optimal overrun risk during rejected take-offs
- Low-frequency airports do not have a sufficient number of landings to make high-quality, verifiable assessments
- Introduction of new processes: TALPA, SAFO Issued (landing distance assessment, reinforced FICON / NOTAM process), NTSB recommendations to FAA



The AST Solution – SafeScan™

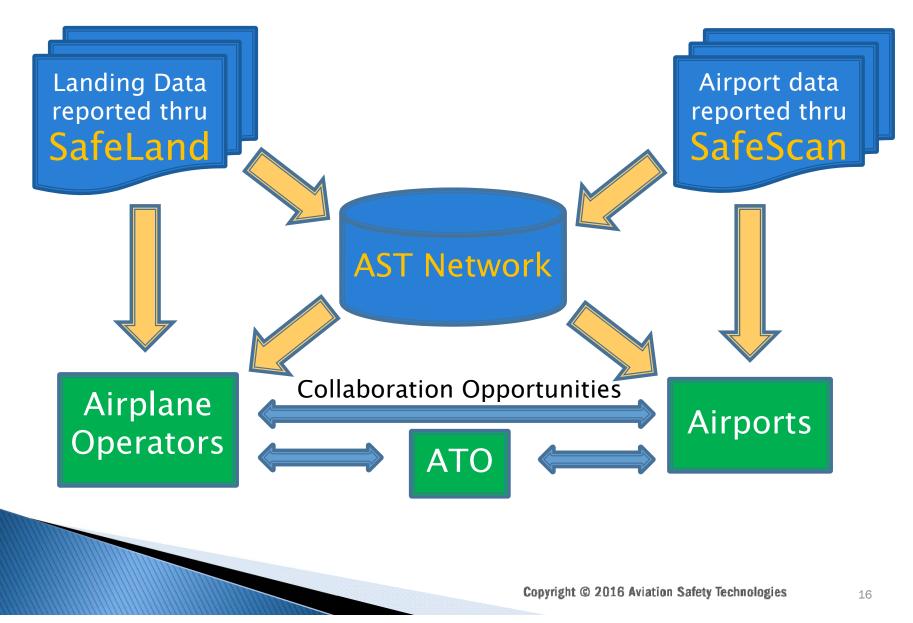


- > Utilizes vehicle-mounted mobile infrared spectroscopy sensors to detect contaminants at any point across the entire airport surface:
 - Runways, taxiways, ramps everywhere
 - Detects and measures all types of contaminants wet, snow, ice, slush
 - Measures depth to 1/1000th inch
 - Measures coverage area, surface, and ground temperatures
- For runways, calculates Runway Condition Code (RCC) automatically for each 1/3 of the entire runway length
 - Provides real time display to airport personnel on any device
- Formats measurements in an output that enables both manual and automated uploading of FICON reports



SafeLand and SafeScan: The AST Network





The AST Network

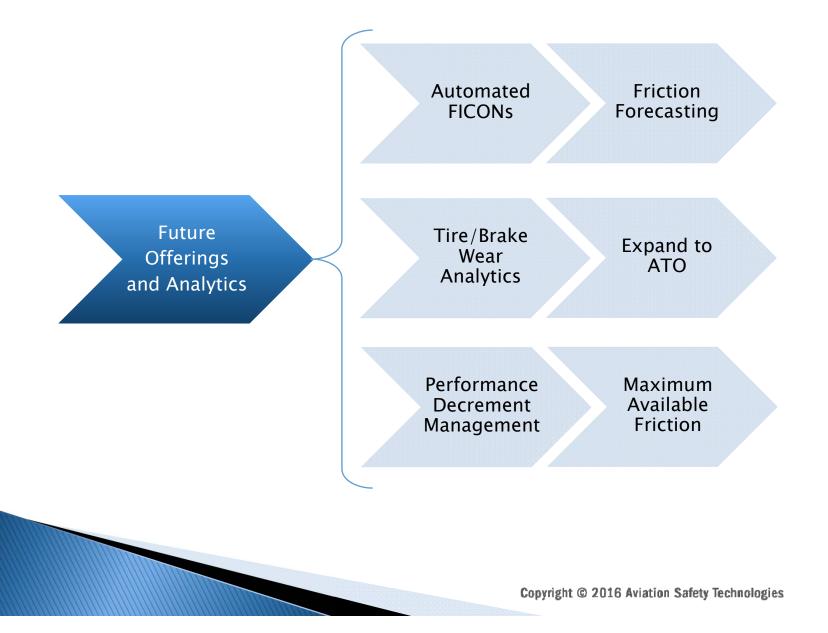


- > AST network links live information from both SafeLand[™] (aircraft-based sensors) and SafeScan[™] (vehicle-based sensors) for complete surface coverage across entire airport
- Allows real-time surface and friction assessments to be shared among all participants (carriers and airports) for optimized situational awareness
- Leverages this real-time information-sharing to help increase safety, reduce liability, and improve efficiency:
 - Reduces operating costs during inclement weather and when friction is reduced for other reasons
 - Increases runway uptime and provides a way to shift runway closures to more optimal times
 - Reduces the frequency of necessary airport chemical treatments, containing costs and providing environmental benefits



Roadmap to the Future







A Win-Win-Win in Surface Mgmnt



Enhanced situational awareness using objective measurements enables proactive planning in all operating phases of surface measurement and management



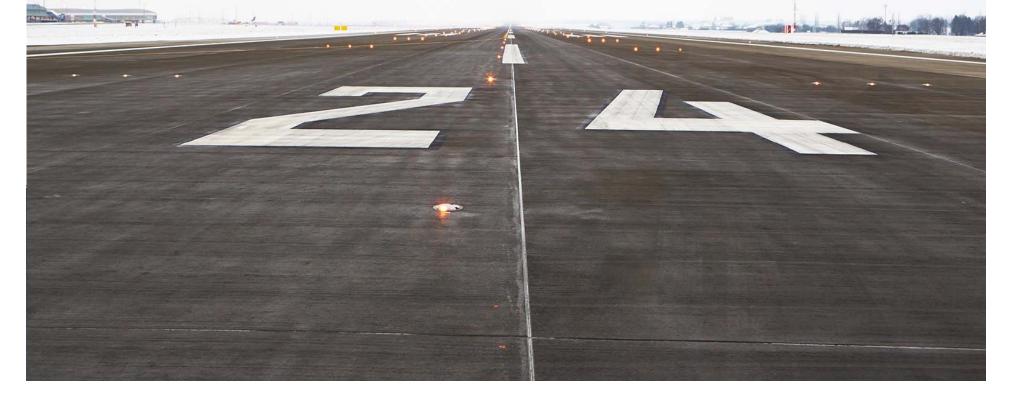
Provides flight data to AST in exchange for Landing Reports

AST Subscription Service

AST Subscription Service

Plus an economic waterfall of benefits through improved reliability

Thank You





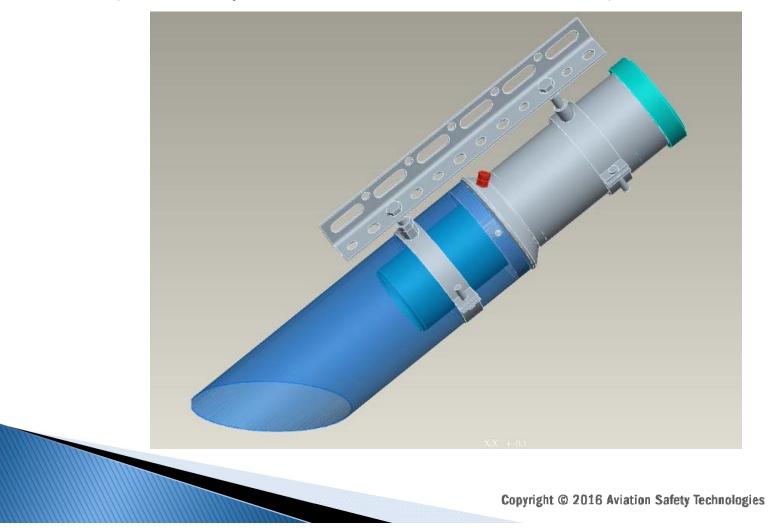
Appendix



SafeScan[™] Contaminate Detector



AST is testing new runway contaminant sensor technology that can uplink runway condition data into SafeLand[™] computational models



Contaminant Detector



SafeScan information can define surface characterization for end-of-landing runways, full-length departures runways, turnoffs, taxiways, and ramps



SafeScan

Contaminant

Sensor



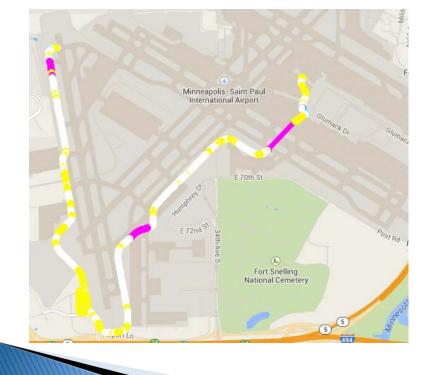
SafeScan Contaminant Sensor

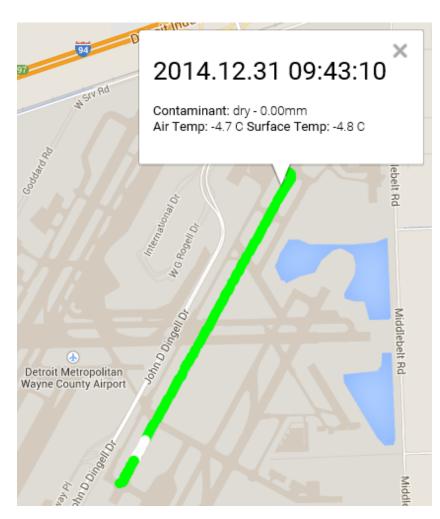
SafeScan Output Display



Web-Based Display

- Color-coded for contaminate type
- Ramps / Taxiways
- Runways
- Click-on-display for detail







Tabular Format TALPA RCAM Notation

User Display

Time	Runway	RCAM 1/3		RCAM 2/3		RCAM 3/3		Recommended
		Code	Coverage	Code	Coverage	Code	Coverage	Treatment
8:12:00 AM	12R	3	35%	4	45%	3	65%	Potasium Acetate
		Snow: 1.2mm		Snow+Slush: 0.8mm		Slush: 1.6mm		
		Surf. Temp.: -3C		Surf. Temp.: -4C		Surf. Temp.: -3C		
		Air Temp.: -9C		Air Temp.: -9C		Air Temp.: -9C		



Additional Airport Benefits



- > Airport Cost Savings: Optimization of chemical treatment and manpower utilization
- Community Impact: Community is typically a huge annual economic engine for the region
 - Example: MSP \$28M/daily, \$1.2M/hourly