Saving Aircraft Maintenance Costs on the Ramp



Aircraft Ramp Movement – No Tugs, No Jets









Development Challenges



- We started doing things the hard way... back in 2005
- Many aircraft interfaces, lots of logic
- As the system developed, we made it simpler and simpler



Simplicity isn't obvious, but it is powerful



Lessons Learned



- New aircraft are expensive
 System must be a retrofit
- Permanent changes are hard
 Must be removable
- Schedule disruptions are bad

 Install in two overnights
 MMEL exempt no AOG issues
- Capital is scarce
 - System must be power-by-the-cycle



The Result



Use – Install – Remove – Lease

 Optional TaxiCam provides excellent situational awareness for pilots

• Nose wheel design saves time





Biggest Pushback Cost: Wasted Time







Saving Time on the Ramp





Conventional Pushback

Lower maintenance and pushback tow costs and hassles.

WheelTug ^{with} TaxiCam



No More of These





\$170,000 (\$100/flight – 1700 flights) Savings Likelihood: High Certainty

Fuel Savings



- 8 minutes of taxi per flight
- 20 lbs/minute net fuel
- 160 lbs total savings
- 24 gallons
- \$34/flight @ \$1.42/gallon
- \$57,800/year



The Value of Time



Operating Costs

\$30/min

http://airlines.org/data/per-minute-cost-of-delays-to-u-s-airlines/ With adjusted fuel utilization costs

Utilization

\$14/min

\$3.6 million lease / 360 days / 12 block hours / 60 minutes

Passenger Time

\$117/min

https://www.faa.gov/regulations_policies/policy_guidance/benefit_ cost/media/econ-value-section-1-tx-time.pdf Assumes mixed high-speed travelers

Engine Wear



- Reduce engine vortices and FOD ingestion.
- Lower engine maintenance costs
- Improved in-flight engine efficiency, especially in sandy / dusty conditions



Break and Wheel Axle Wear



- Smooth taxi in stop-and-go queues for taxiing and de-icing
- Lower maintenance costs for carbon brakes
- Reduce wear on the NLG wheel axle



Entry Into Service



- 976 aircraft in backlog
- Lease agreements with agreed metrics
- MRO network under discussion
- Public demo after certification tests in 2018
- EIS in early 2019 for B737NG



22 airlines already signed up!

Making Tug-free and Jet-free Aircraft Movement a Reality



