Weather Delay Impact to Cargo Customer Service

• Weather impacts all aspects of the Air Cargo Operation.
  – UPS Meteorology Department is focused on the operational and time-critical nature of service commitments.

• Canceling flights is not an option.
  – Our service commitments are guaranteed. If we do not meet the service commitment the delivery is free.

• Satisfied customers = Growth in Business = Employment = Efficient Competitive Economy
How Taxi Time Effects Cost

- Every Additional Minute to Taxi Time Equates to:

<table>
<thead>
<tr>
<th>A/C Type</th>
<th>Gal/Min</th>
<th>Avg. Origin Fuel</th>
<th>$ Cost per Min</th>
</tr>
</thead>
<tbody>
<tr>
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<td>6.4</td>
<td>$3.56</td>
<td>$22.80</td>
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<tr>
<td>B767</td>
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<td>MD11</td>
<td>16.4</td>
<td>$3.56</td>
<td>$58.40</td>
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<tr>
<td>B747-4</td>
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<td>$3.56</td>
<td>$75.80</td>
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Average Per Minute Taxi Cost UPS Fleet = $42.90
117 SDF Flights X $42.90 = $5020/Minute
$5020 X 4 Nights Full Launch = $20,100
$20,100 X 52 Weeks = $1,050,000/Year
## How Flight Time Effects Cost

- Every Additional Minute to Flight Time Equates to:

<table>
<thead>
<tr>
<th>A/C Type</th>
<th>Gal/Min</th>
<th>Avg. Origin Fuel $</th>
<th>Cost per Min</th>
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<tbody>
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<tr>
<td>B747-4</td>
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<td>$170.90</td>
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</table>

Average Per Minute Cost UPS Fleet = $114.60

117 Flights X $114.60 = $13,400/Minute

$13,400 X 4 Nights Full Launch = $53,600

$53,600 X 52 Weeks = $2,780,000/Year
How Arrival Delays at SDF Hub Affect Costs

- Cost Per Minute Late Arrival into SDF Hub = $812
  (Cost is for Hub Workers Only, does not include Support Staff or, Downstream Impact)

  $812 Per Minute Late Per Flight
  1 Flight 15 Minutes Late = $12,180
Summary: Costs Per Minute for Weather Delays

• For Every Taxi Minute = $42.90

• For Every Minute Enroute = $114.60

• For Every Minute Into SDF Hub = $812.00
Quantify Costs/Benefits of Weather Forecast Decisions

- Relatively easy to quantify number of minutes late due to weather.
- Hard part is quantifying AVOIDABLE weather delays.
- Good Forecast → Understand Operational Impact (UPS Meteorologist) → Communicate Risk Effectively to Decisionmakers → Make Operational Changes that Reduce the Impact and Cost.
- Costs of Doing Nothing vs. Taking Action.
- With new forecast tools, takes time to gain confidence in tool and then to make effective operational changes.
Decision Threshold Determined by Costs/Benefits

Example 1: Deicing SDF Departure fleet for Frost
- Costs $50,000 to pretreat entire fleet
- Getting caught by surprise Costs 100 departures 10 minutes delay each. Down line costs $1 Million
- Breakeven Cost/Benefits Ratio 20:1 or 5%
- Operational Decisions made at only 10% Risk of Frost
- Occurs 30-50 times each winter at SDF
Frost Example

• Expected Frost to pre-treat 100 aircraft requires 20-25 deice trucks and 40-50 people taken from the hub. No flight delays.

• Surprise Frost requires additional 30 deice trucks and additional 60 people (100-110 total), plus costs 10 minute delay each flight. ($1M approximate cost)
Decision Threshold Determined by Costs/Benefits

Example 2: Intermediate Fog Risk

- SDF-FSD-YYC flight with fog risk at FSD.
- Extra section flight set up SDF-FSD so that SDF-YYC operates direct. Costs $16,000 to operate extra section, avoiding $130,000 in Service Failures.
- Breakeven Cost/Benefits Ratio is 130:16 or 12%.
- 30% Risk of below-minimums fog at FSD triggers extra section.
- This occurs 30-50 times every year at UPS.
Decision Threshold Determined by Costs/Benefits

Example 3: Spreading out Hub Arrivals due to Severe Adverse Weather during Arrivals (T-storms/Winter Storm)

- Direct Costs $1 Million
- Potentially Avoids $2 Million Costs and/or 100,000 Service Failures (10% of Volume)
- Successful Forecast must be accurate within 30 minutes 5-8 hours in advance, at 65%+ Confidence Level
• 3 times this year, UPS used a self-managed ground delay program to reduce the number of arrivals as T-storm line crossed SDF. Result: No Diversions, but averaged 30-45 minutes late for departures.
  – Indy Center/SDF Tower give us a lowered arrival rate, UPS manages the rest.
  – In the past, we would send all the flights on schedule, loaded with as much gas as possible, and end up with 5-20 diversions out of 117 flights.
Decision Threshold Determined by Costs/Benefits

Example 4: The Popsicle

- Example: Forecast Freezing Rain at PDX with strong winds.
- Conditions exceed deicing capabilities. Trying to operate results in crew timing out and aircraft stranded, sometimes for days.
- Aircraft not available cost – averages $32,000/day.
- Cost of service failures (~$500,000)
- Best option is to relocate aircraft to BFI (Seattle), truck volume to BFI and fly it out of there.
Avoidable Weather Delays

• Large, Complex Networks must be flexible.
• Forecast must meet the needs of the users/decisionmakers.
• Users/decisionmakers must have confidence in the forecasts. 2 or 3 consecutive busts will stifle proactive weather decisions.
• Large, Complex Networks change over the years. Past baseline metrics may not be applicable today.