

Republic / Parker Data Analytics Partnership

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ENGINEERING YOUR SUCCESS.

Republic Airways

Republic Airways



Headquartered in
Indianapolis, IN

6000+
Employees



1000+
Departures/Day



Fleet of 219 Embraer
E170/E175

Background

Project Side

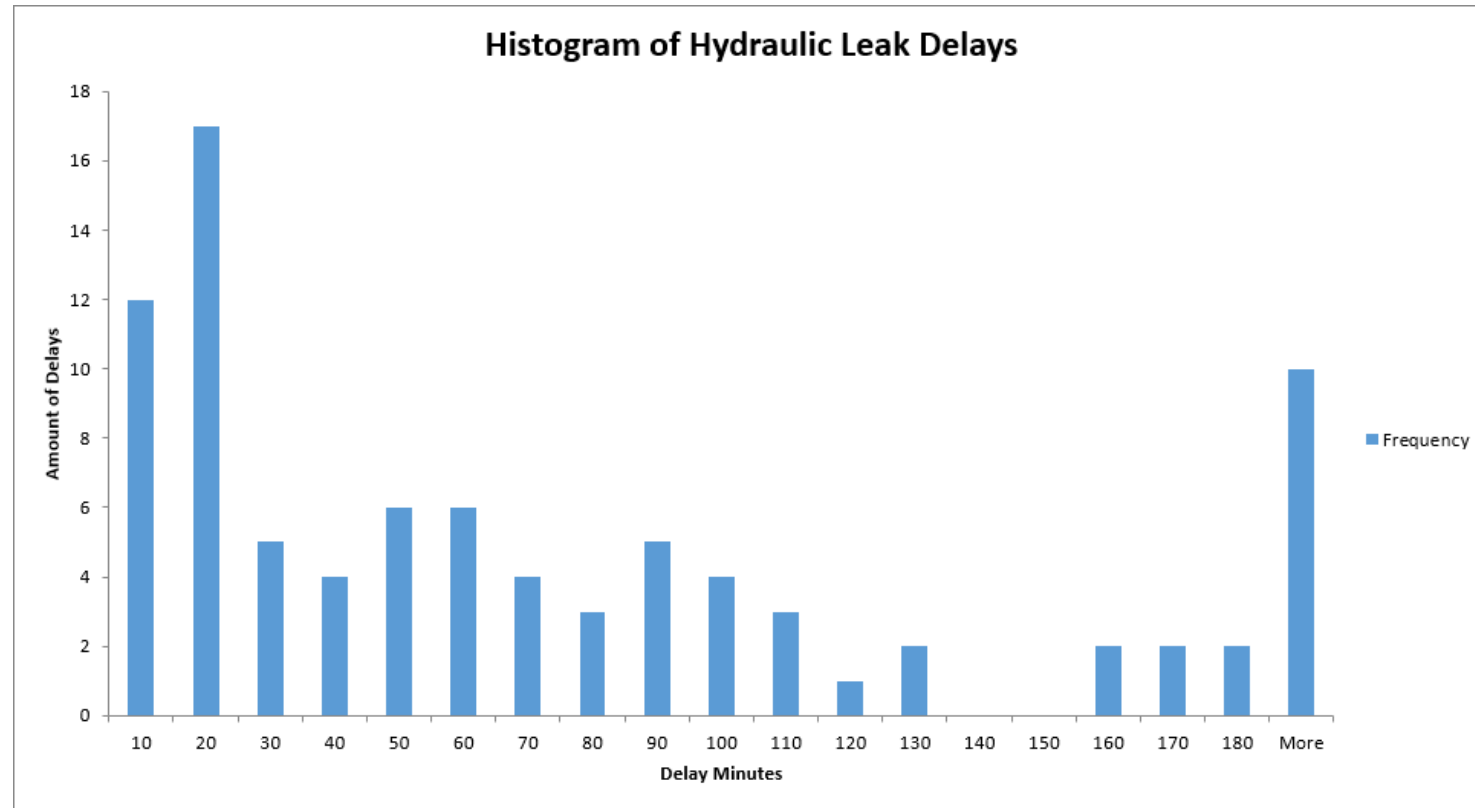
- Project kicked off in 2021
- Data sharing & IP agreement signed by both parties
- **Goal:** Develop health monitoring algorithm for the Engine Driven Pump and other Parker components to improve system performance & reduce unplanned downtime

Data Side

- Parker received 5 years of Republic's QAR flight data
 - ~200 ERJ aircraft
 - 1200 parameters
- Data in Microsoft Azure Cloud
- Maintenance Logs
- Data was decoded into engineering units (original format is binary)
- Parker is receiving latest fleet data in the cloud approximately every 10 days

Hydraulic Delays – 2 Years

- 66 Delays – Total 5947 Min
 - 43 LO QTY Delays
 - 23 Main Hydraulic System Leak Delays
 - 8 Delays over 3 hours

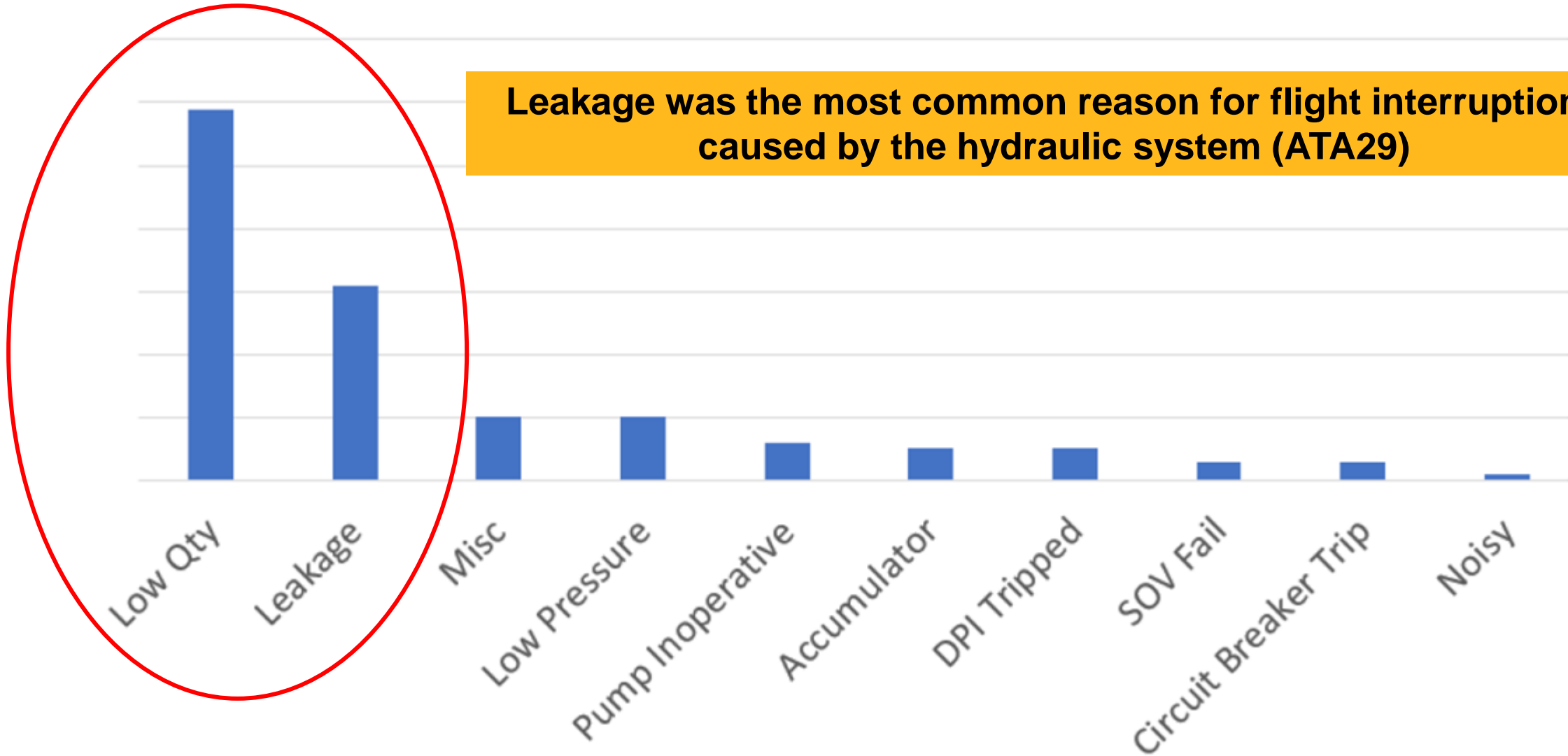


ATA29 Flight Interruptions in Republic's Fleet

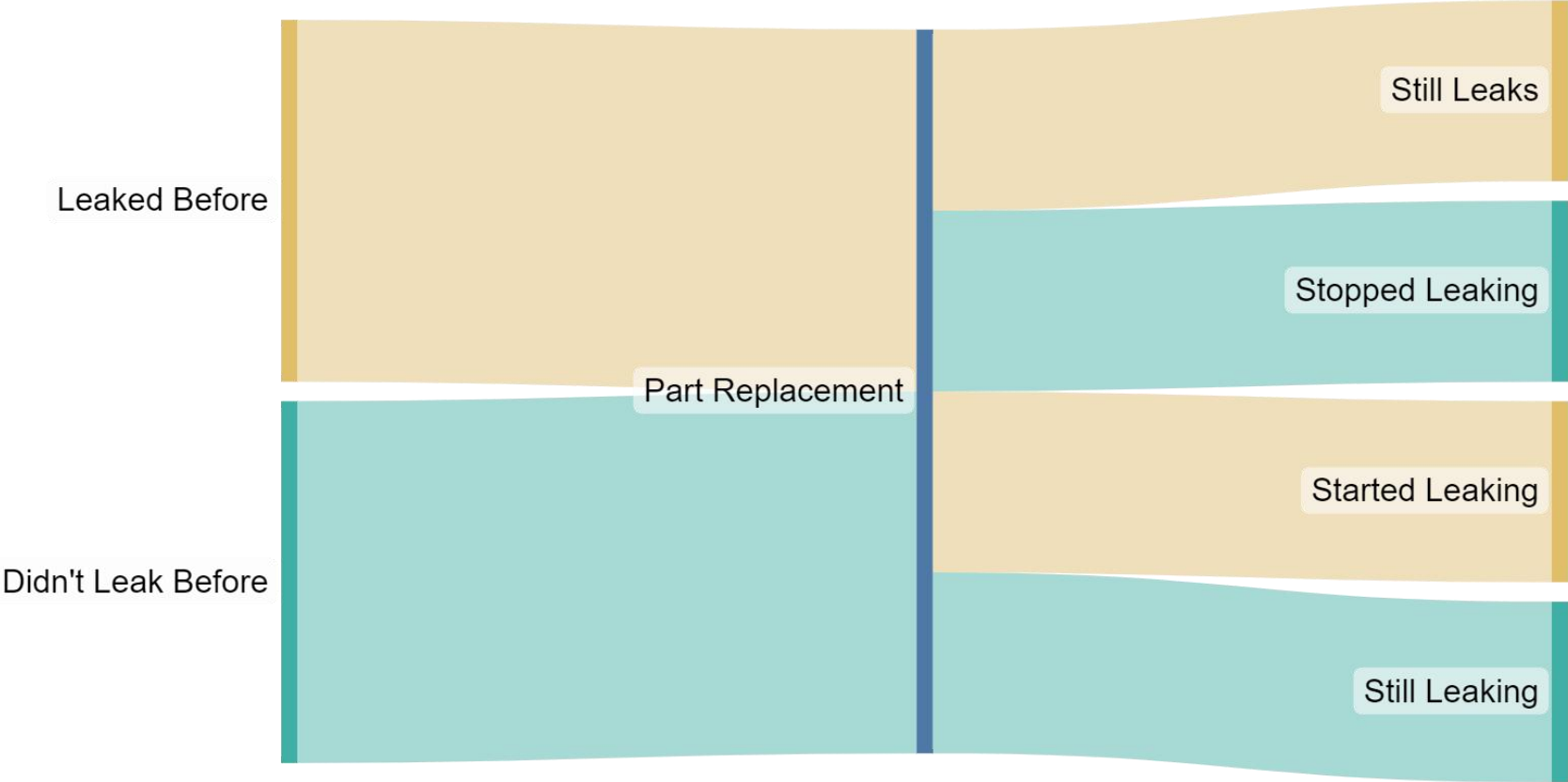
July 2019 – June 2020



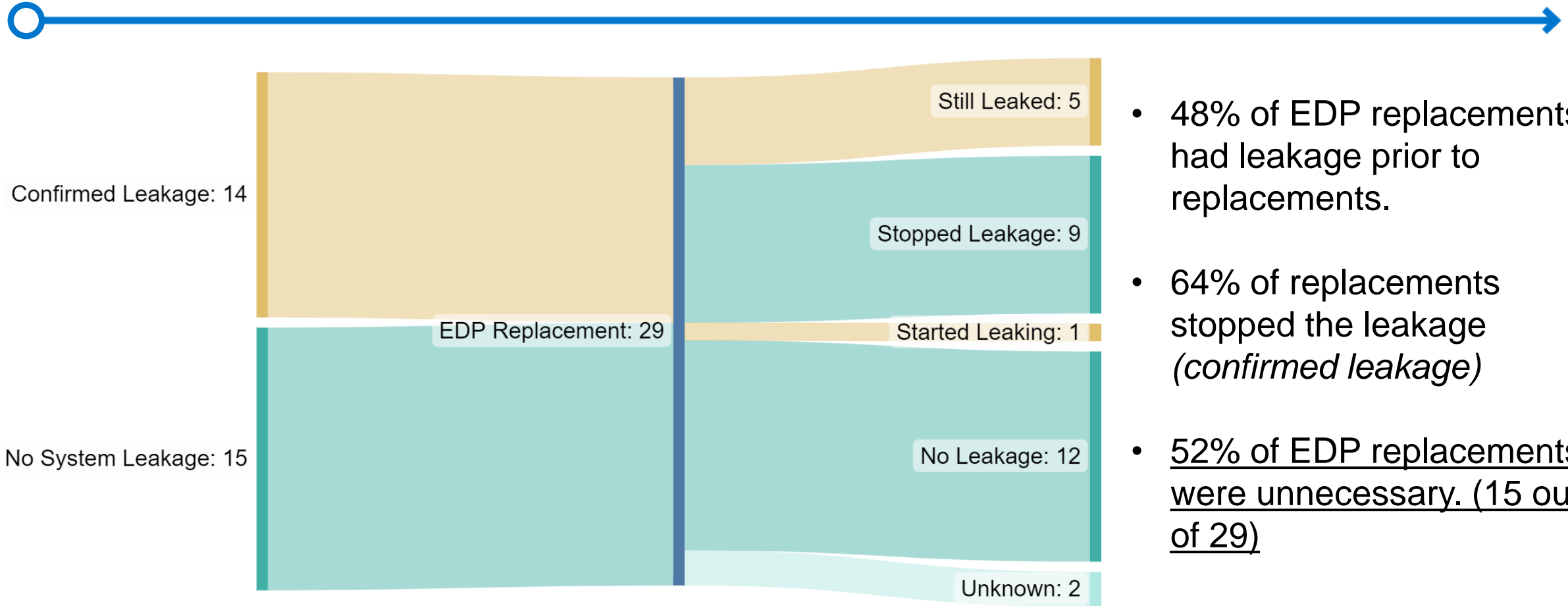
Leakage was the most common reason for flight interruptions caused by the hydraulic system (ATA29)



Possible outcomes when removing parts



EDP unscheduled removals

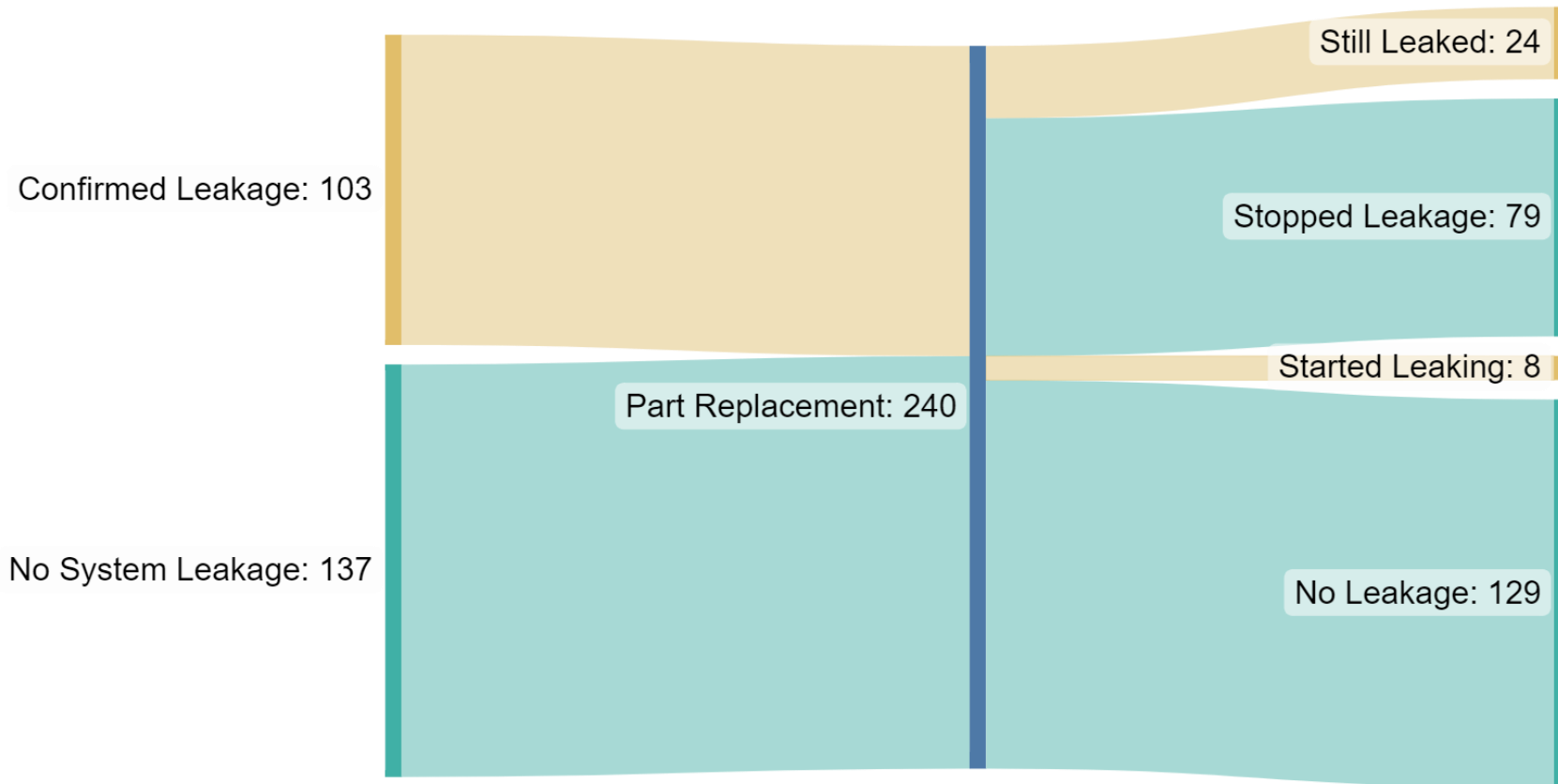


- 48% of EDP replacements had leakage prior to replacements.
- 64% of replacements stopped the leakage (*confirmed leakage*)
- 52% of EDP replacements were unnecessary. (15 out of 29)

Low sensor resolution can lead to low fix success rate

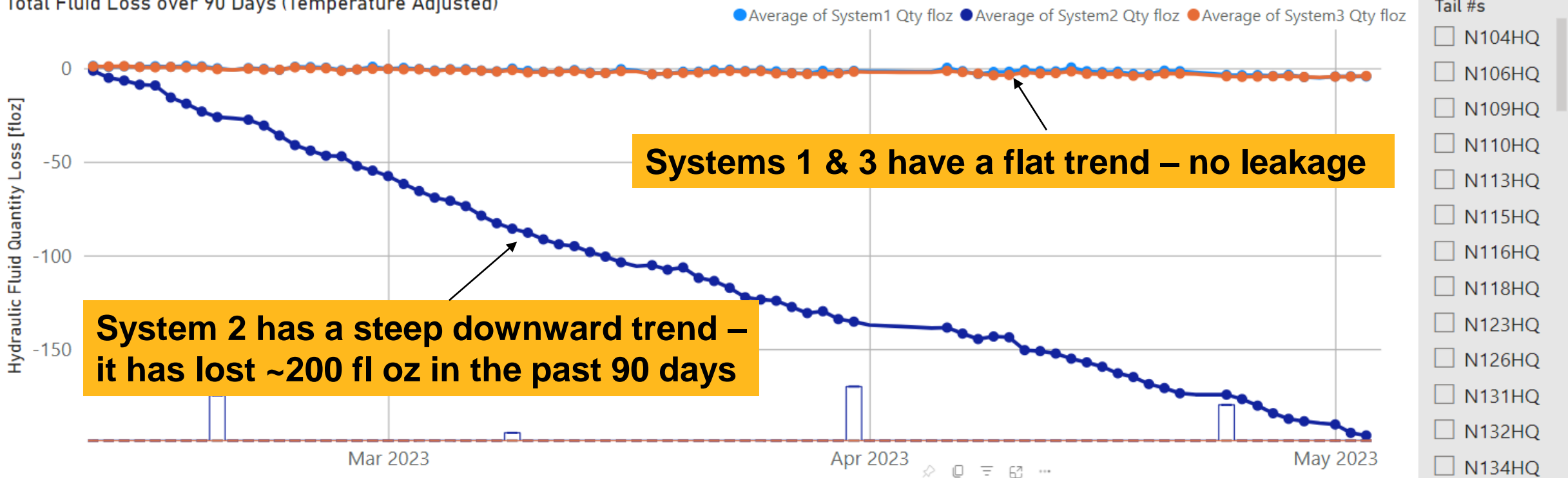
Hydraulic system removals

We examined all parts on that were replaced due to leakage (ATA 27 & 29). [July 2019 – June 2021]



- 43% of all replacements had leakage prior to replacements.
- 77% of those replacements stopped the leakage (*confirmed leakage*)
- 57% of part replacements may have been unnecessary.

Total Fluid Loss over 90 Days (Temperature Adjusted)

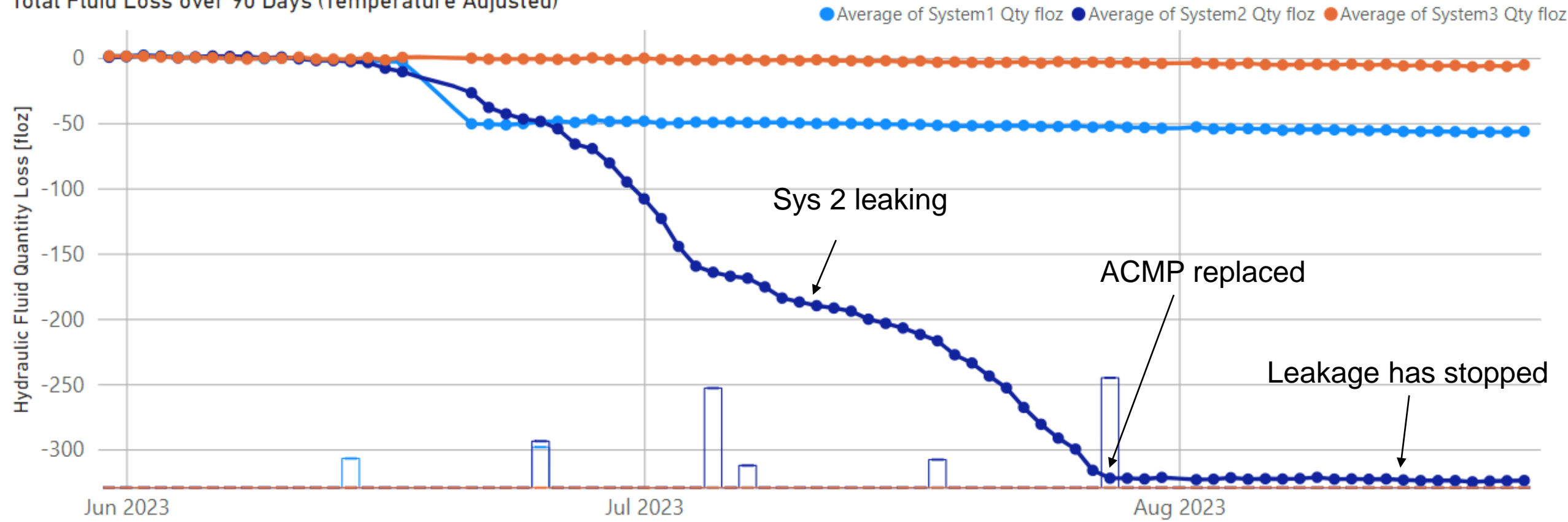


Tail #	Sys #	Total Leaked Vol. 90 days [floz]	1st Detected [days ago]	Max Leak Rate [floz/day]	Last Available Ft. Data
###	2	301.20	7	80.60	April 30, 2023
###	3	271.60	65	45.30	April 26, 2023
###	2	254.40	53	22.00	May 5, 2023
###	2	230.20	53	15.80	April 25, 2023
###	1	209.30	58	7.50	April 29, 2023
###	2	197.80	64	6.90	May 3, 2023
###	1	187.20	57	56.40	April 23, 2023
###	2	180.50	72	60.80	April 30, 2023
###	1	167.10	41	29.80	April 26, 2023
###	1	152.00	65	11.60	May 2, 2023
###	1	150.80	49	13.60	April 30, 2023
###	2	141.00	20	18.00	April 30, 2023
###	2	134.00	22	9.30	April 2, 2023
###	3	132.10	50	4.00	May 2, 2023

Today's Unique Tail #s	Today's System Count
63	77
Today's New Tail #s	Today's New Sys. Count
0	0
Tail #s Removed from Yesterday	Sys. Removed from Yesterday
0	0

Last Refreshed (Eastern Time)
5/10/2023 11:44:04 AM

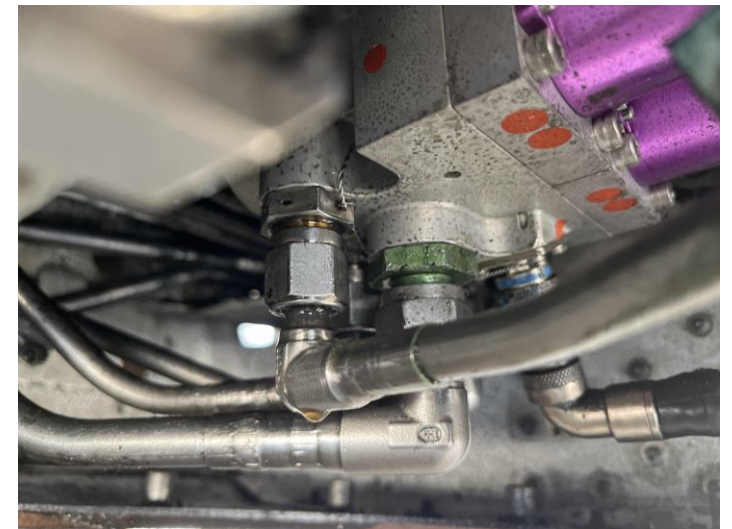
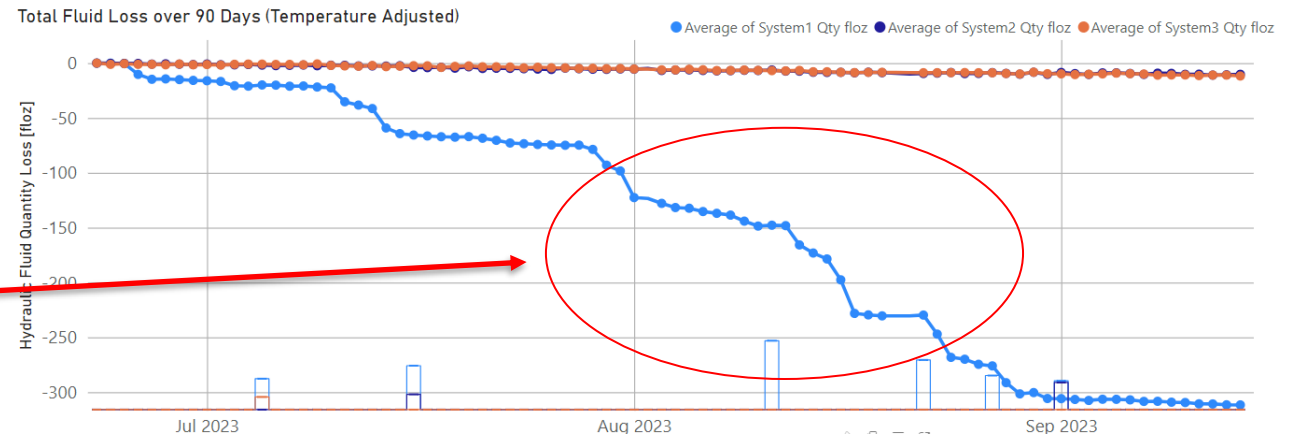
Total Fluid Loss over 90 Days (Temperature Adjusted)



Using the leakage detection dashboard, Republic identified a hydraulic leakage issue with this tail number. The maintenance team replaced a leaking ACMP in system 2. The dashboard shows the leakage stopped.

Caught Leak with Data

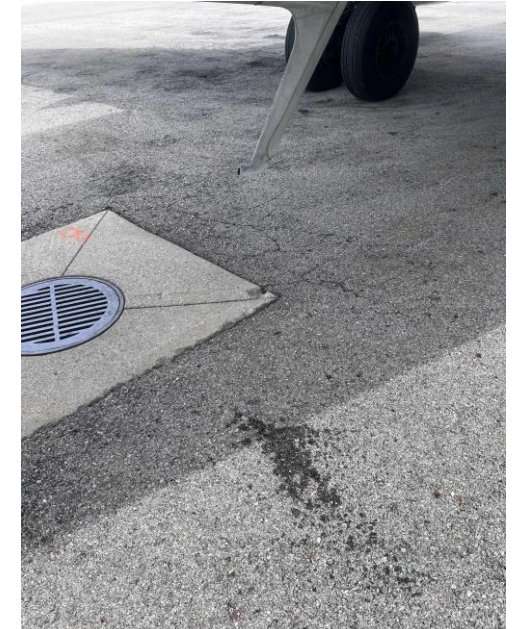
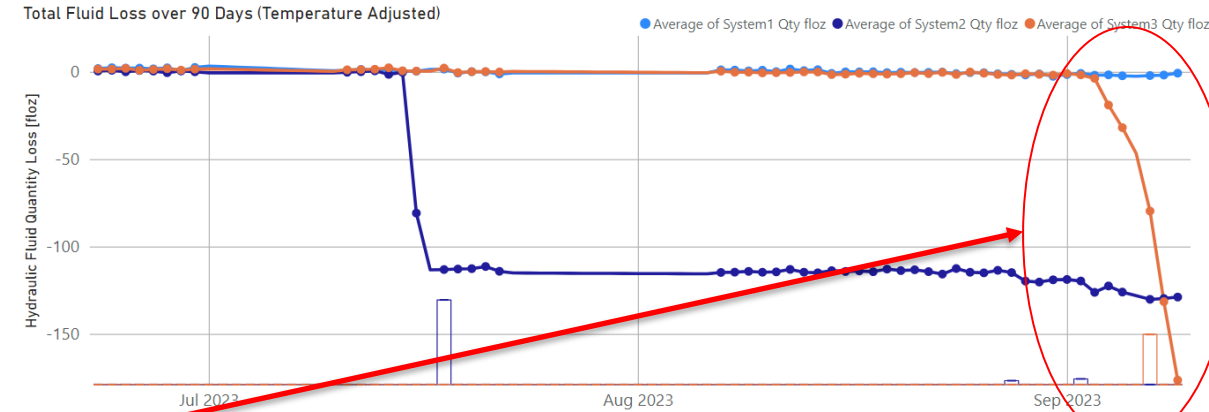
- Steady leak since July
- Leak intensified in August
- System 1 serviced 5 times
- Lost over 300 oz
- Brake Control Valve 1 was found leaking



Missed Leak Due to Data Lag

Hydraulic Leaks

- Data received every 2 weeks
- Aggressive leak over 6 days
- Total loss of hydraulic system 3
- Reservoir 3 leaking into ecology bottle
- Lost 180 oz in 6 days



Summary



- Since July 15th
 - 19 aircraft identified with leaks
 - 16 aircraft were found with confirmed leaks

Challenges and Next Steps



- Challenges within this initiative
 - Lack of Data
 - Data monitoring bandwidth
 - Technician bandwidth
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- Next Steps
 - Connected aircraft to improve data frequency
 - Continue to refine the process

Questions?

