



NextGen CDA's

Solutions for Aviation Environmental Challenges – A Brave New World!

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What's the Problem?

Terminal Area Operations are less efficient than technically possible.

Loss of efficiency contributes to higher levels of fuel consumption, emissions and noise.

Why Do We Have the Problem?

The Dumping Effect!

Center “dumps” traffic into the TRACON to provide sufficient pressure on the airport to maximize the arrival rate.

Why Do We Have the Problem?

Controller Challenges

Actual flight path ground tracks lack predictability and consistency coming into the Tracon

Each aircraft flight path managed largely by vectors and voice clearances – one at a time

- high workload environment for controller
- tactical response – limited strategic “big picture”

Accuracy of surveillance data

No help from the pilots because they’re “out of the loop”

Controllers do a great job with the tools that they have!

What's the Result?

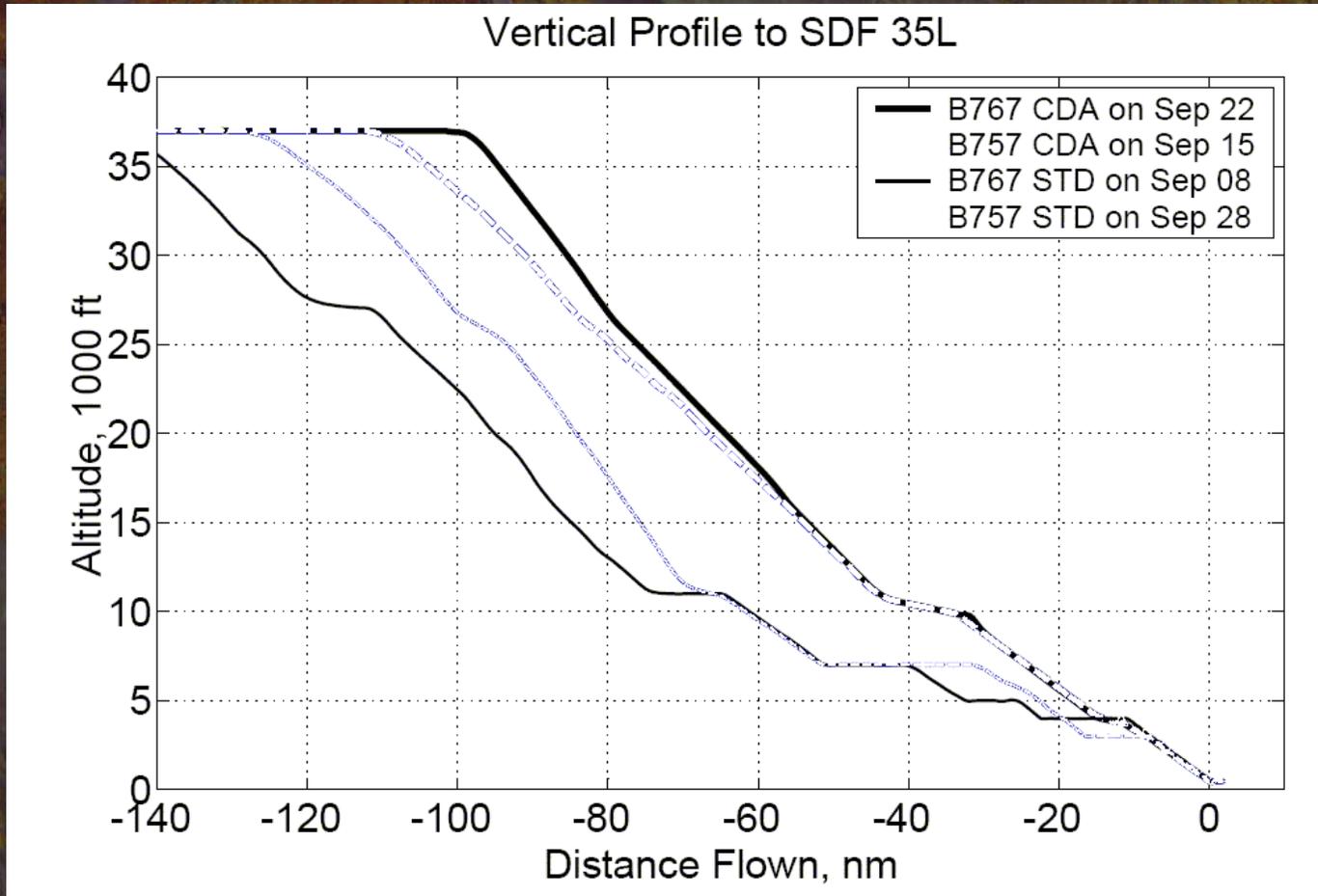
High density traffic situations result in excess low level vectoring

- increases miles and time flown to runway
- can increase distance between aircraft as controllers become task saturated
- decreased predictability and consistency

Loss of Capacity and Efficiency while increasing Fuel Burn, Noise and Emissions

Vertical Profile

The difference between the 2 black lines is our opportunity for improvement



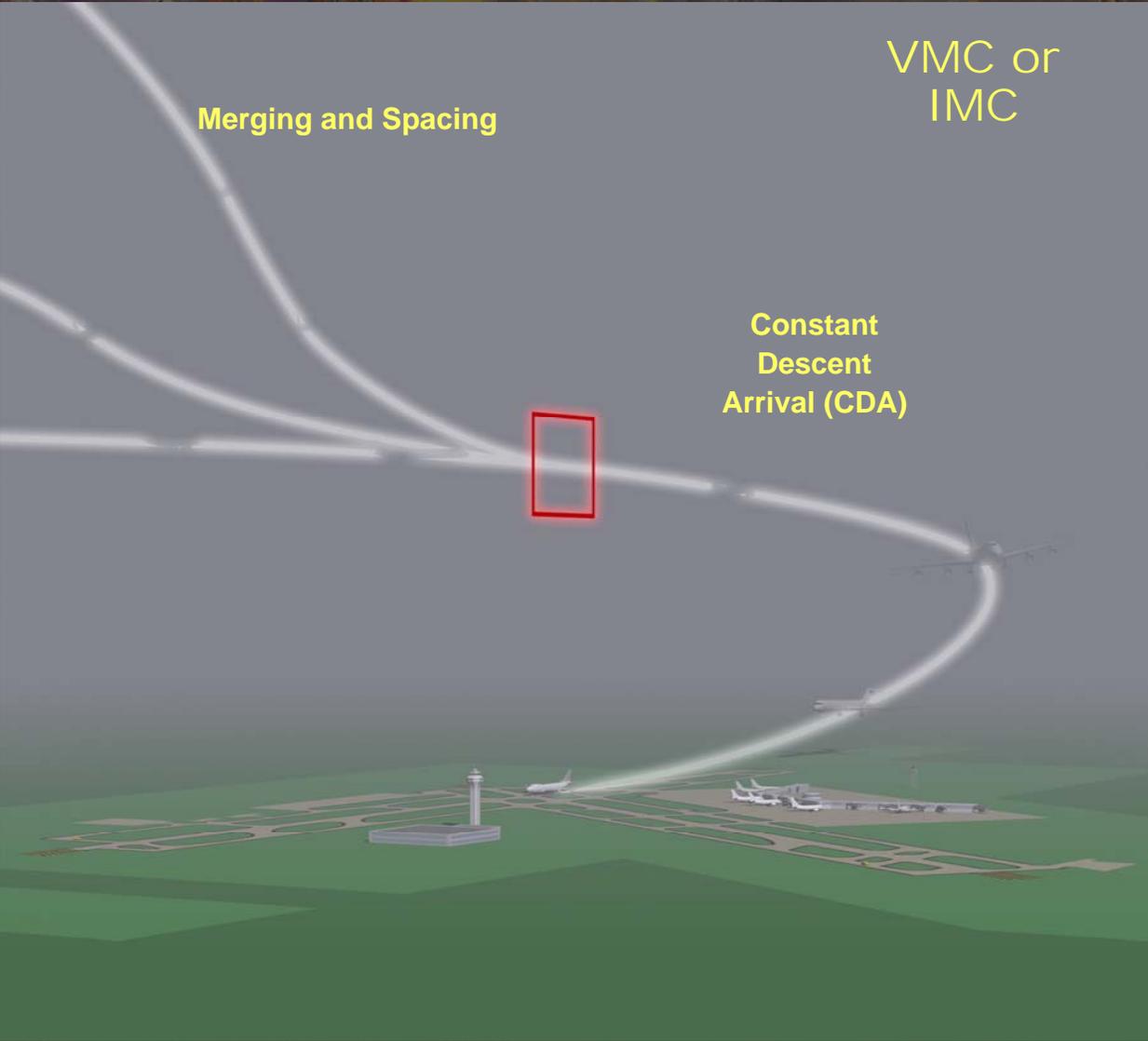
How Do We Fix It?

Provide a highly predictable, precisely spaced and metered flow of traffic to the runway utilizing the full capabilities of the aircraft to fly optimized descent profiles and consistent ground tracks in almost all weather conditions.

Continuous Descent Arrivals – Optimizing the Vertical Profile

October 2004 conducted successful flight trials of RNAV Continuous Descent Arrival Procedures

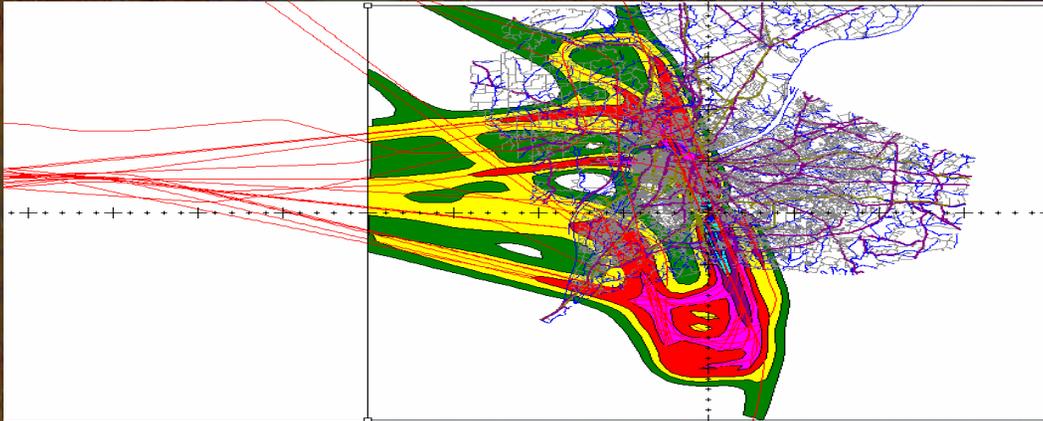
- vertical path controlled by FMS
- executed idle power descent profile from enroute altitude to final approach
- highly consistent ground tracks
- 125 procedures were executed successfully
- slight loss of airport capacity



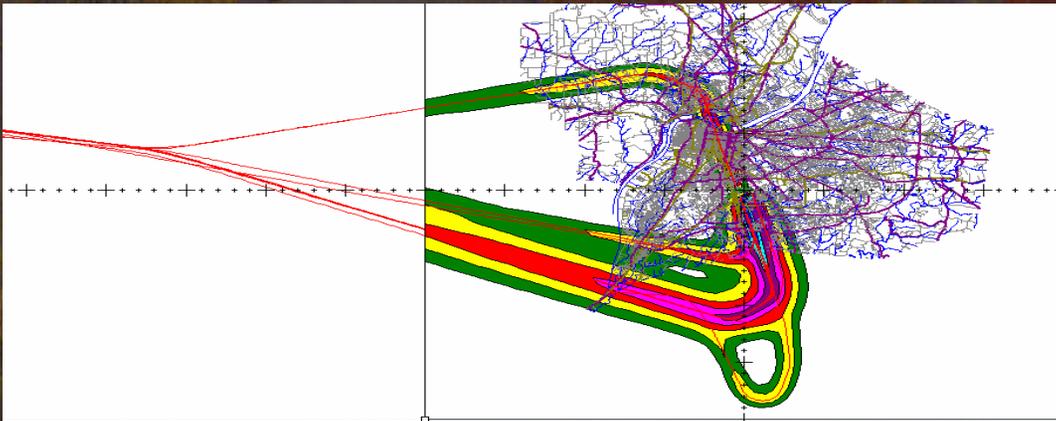


Results-2004 CDA Trials

Baseline (Sep 28-Oct 2)



Reduced Noise Impact (Sept 14 -18)



30% reduction in noise (*up to 6 dB*)

- **34% reduction in nitrous oxide (NOx) emissions**
(Below 3000 ft)
- **250 to 465 lbs less fuel burn/flight**

What's a NextGen CDA?

A CDA that is flown with responsibility for merging and spacing tasks delegated to the flight crew.

CDA operations with an increase in airport capacity.

How Do We Implement Quickly?

Developed “simple but elegant” operations concept based on the 2004 trials

Working with ACSS on Merging and Spacing

- tool for pilots to space and follow
- includes Surface Map application

Working with Boeing to implement Class 3 Electronic Flight Bag

- used for multiple purposes
- used as display for traffic and ADS-B applications

How Do We Implement Quickly?

Working with team from MITRE, NASA and FAA on ground based sequencing tool - ABESS

- airline based near-term – provide sequence and time interval to our arrivals
- ATC based next phase

Leveraging Surface Management System in our operation to

- provide visibility on traffic from departure gateway to parking at gate in SDF
- feed the sequencing tool
- manage our surface operations

Merging and Spacing Operations

- Flight Deck-Based Spacing
 - ADS-B Surveillance
 - CDTI
 - Speed Guidance



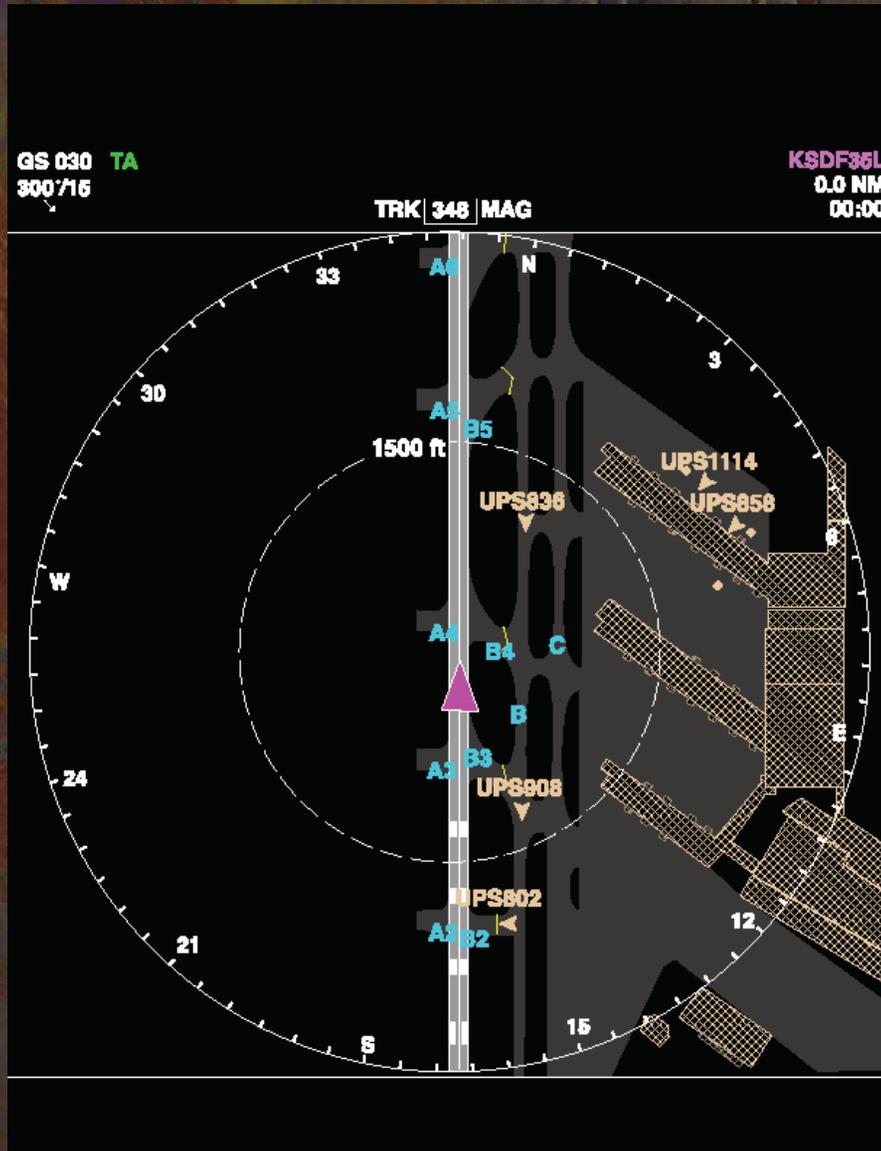
Surface Area Movement Management

Airport surface map and traffic displayed in the cockpit provides surface situational awareness leading to reduction in runway incursions and traffic conflicts

- tracks the movements of own aircraft and other ground and airborne traffic in the terminal area using ADS-B
- alerts crews of potential conflicts with traffic



EFB-SAMM Application



Surface Management System

Provides surveillance on all aircraft and limited number of ground vehicles

Enhanced ability to manage aircraft movement

- reduced queuing on departure
- dynamic fix balancing
- large savings in fuel burn and emissions and noise

Success Factors

Easily accepted by controllers

- responsible for safety and separation
- intervenes when necessary
- handles non-participant as they do today
- has “the big picture”, more managing, less controlling
- greatly reduced workload

Easily accepted by pilots

- little or no vectoring
- just fly the procedure using spacing tool
- predictable and consistent

Success Factors

Requires no change in ATC ground systems

RNP/RNAV procedures widely accepted and proven

UPS experience leads the way

Dedicated development and certification team with ACSS, Boeing

FAA Tiger Team

Success Factors

Multiple applications in one piece of equipment, all have pay back, bundled together make retro-fit affordable

Motivated by Safety, Capacity and Efficiency gains short term

- Surface Maps reduce risk of ground collisions
- UPS expects 10% - 15% capacity gains
- NextGen CDA's provide time and fuel savings
- Strategically correct – supports FAA, Eurocontrol, JPDO long-term direction to Performance Based ATM

Portable to other airports and operators

Food for Thought

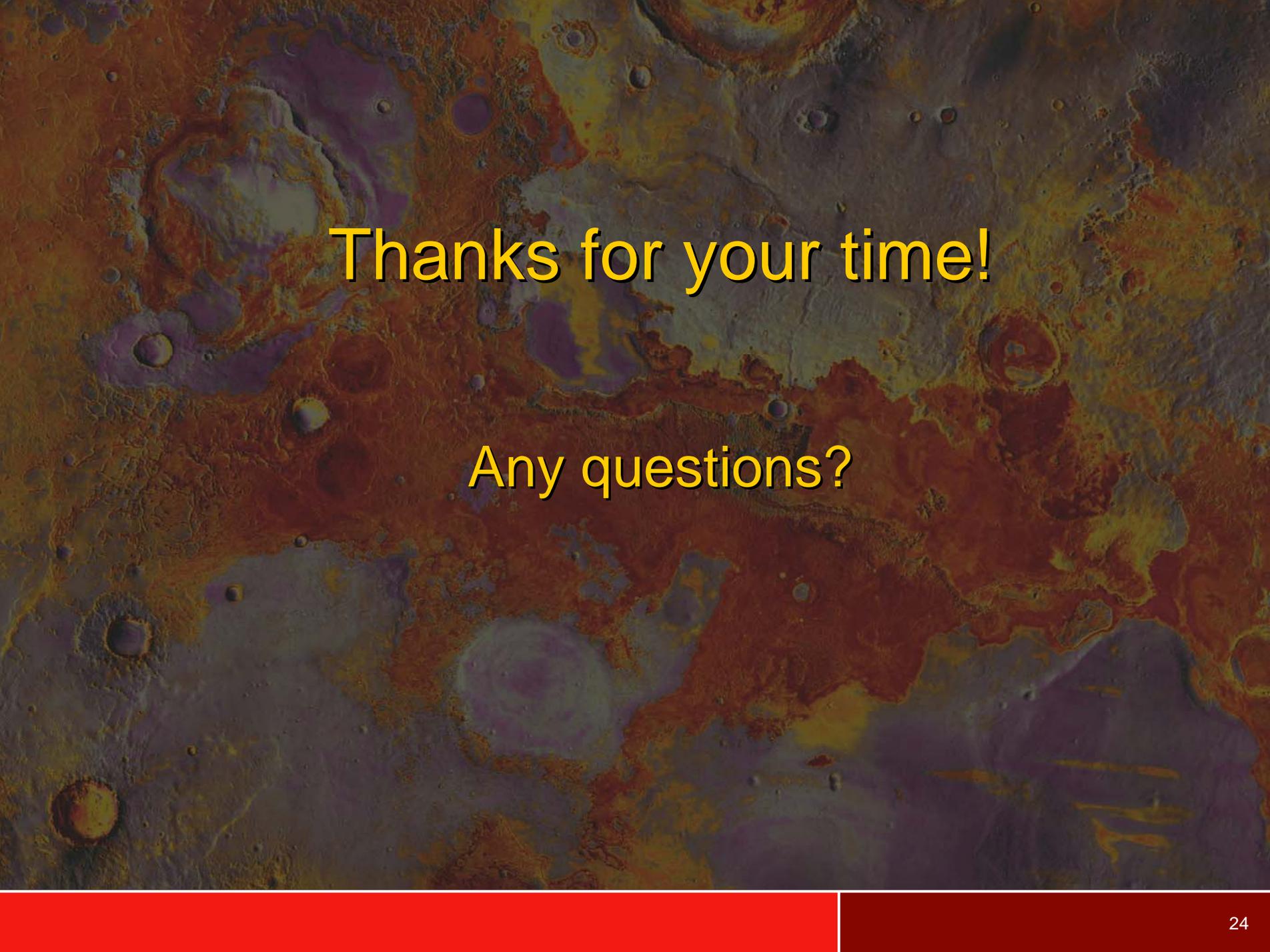
General Powell's $P=40\%-60\%$

Keep it simple – its already complex enough

Sometimes we need to quit “fixing to do” and actually do something

There is only so much that can be predicted – we learn by doing and will make adjustments as we go

Implementation is a political problem – the technology is ready to go



Thanks for your time!

Any questions?