



# Airspace Management

*Because planes shouldn't crash into each other in the sky*

# Quick intro

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- [Linkedin](#) | [Twitter](#) | [Website](#)



zendesk sunshine™



Pivotal Labs®





## Today's product review

**Client:** US Air Force  
**Air Tasking & Re-Tasking (ATR)**  
**Airspace Management**

# Table of Contents

01

## The Mission

What is airspace, anyway? How does it fit into mission planning?

02

## Discovery

What problems & opportunities exist within today's planning process?

03

## Our Hypothesis

What if we completely changed how this works?

04

## "Spacer" is Born

A glorified form  
=/= shapes on a map

05

## Warfighter Adoption

Risks, challenges,  
& hoops to jump through

06

## Takeaways

Learnings,  
realizations,  
& a-ha moments

# How the Air Force operates

*simplified*



**01**

## **Plan**

Get missions planned and communicated with planes, personnel, and purpose



**02**

## **Execute**

Carry out the planned missions to spec

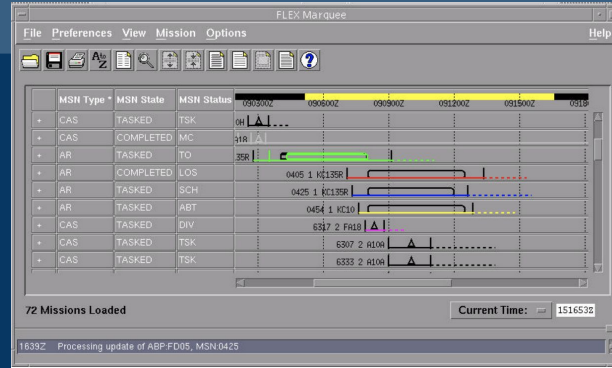


**03**

## **Analyze**

Review what happened, fix mistakes, carry forward learnings

# How the Air Force operates



*Theater Battle Management Core Systems (TBMCS)*

**LOCKHEED MARTIN**



# How the Air Force operates



Pivotal Labs®



**KESSELRUN**

# How the Air Force operates

*simplified*



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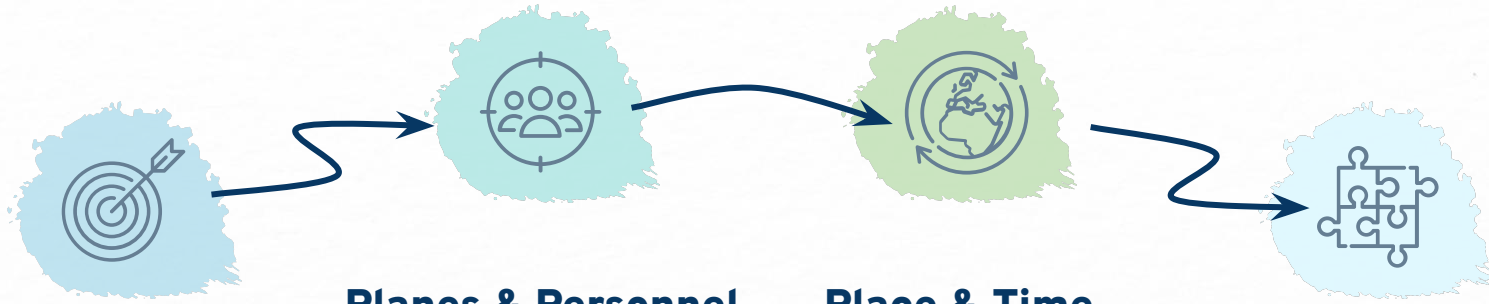


**03**

## **Analyze**

Review what happened, fix mistakes, carry forward learnings

# What's in a mission plan



## Purpose

Common examples:  
Striking or spying

## Planes & Personnel

Who will carry out  
the mission with  
which equipment?

## Place & Time

When and where  
the mission will  
happen

## Details

Related objectives,  
supporting logistical  
information, etc.

# Anatomy of an airspace

*How to book a conference room in the sky*

## Location: Lat/Long

The exact geolocation for the planned mission - often using pre-defined "killboxes" or a single focal point

## Altitude: Airspace height

A 5,000-25,000 foot tall slice of the sky above the airspace location

## Timing

A one-time "reservation" block of anywhere from 1-24 hours, sometimes recurring

## Shapes, tracks, tankers

geometric shapes of airspace, paths for planes to get to/from the airspace, and potential in-air gas tank pit-stops

# AIRSPACE CONTROL MEANS REQUEST (ACMREQ)

**I. Requester's Information**

**Rank/Name:** \_\_\_\_\_ **Phone:** \_\_\_\_\_ (DSN if outside AOC)

**Duty Position:** \_\_\_\_\_ **Duty Location:** \_\_\_\_\_

**II. ACM Information** (Fill Out All Applicable Items, Instructions on Reverse)

**Type of Request:** (Check One)    **New**    **Change**    **Delete**

**ACM Name:** \_\_\_\_\_ **ACM Usage:** \_\_\_\_\_ (Options on Reverse)

**Activation Period:**

**From:** (Date/Time) \_\_\_\_\_ / \_\_\_\_\_ **ATO(s) Affected:** \_\_\_\_\_

**To:** (Date/Time) \_\_\_\_\_ / \_\_\_\_\_

**Coordinates:** (Lat/Long, WGS84 Datum Only)

1. _____	5. _____	9. _____
2. _____	6. _____	10. _____
3. _____	7. _____	11. _____
4. _____	8. _____	12. _____

(Continue on reverse)

**Shape:** \_\_\_\_\_ **Radius:** \_\_\_\_\_ NM

**Orbit/Track Width:** \_\_\_\_\_ NM   **Turn Direction:**    Left    Right    Center (Left is Standard)

**Altitude(s):** \_\_\_\_\_ (Bottom)   \_\_\_\_\_ (Top)   AGL  MSL

**Remarks:**

\_\_\_\_\_

\_\_\_\_\_

**III. This Section for Airspace Use Only**

ACMREQ OC: \_\_\_\_\_ (initials)   Plans    Ops    DCO/DDO: \_\_\_\_\_ (initials)

**Airspace Conflicts**

NO  ⇒   ACM Approved: \_\_\_\_\_ (initials)   \_\_\_\_\_ (date)

YES  ⇒   Conflicting ACMs: \_\_\_\_\_



**Local**

The e  
plan  
pre-c  
focal



**Time**

A one  
anyw  
some



**Height**

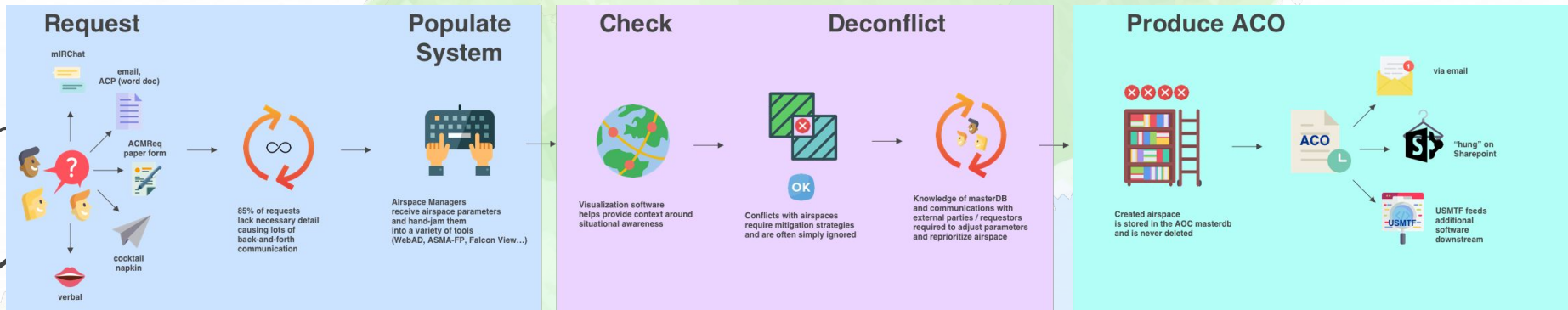
of the  
cation



**Markers**

m the  
es for  
air gas  
stops





Visually mapping out the existing process

AMSNDATN/F7125/-/-/ATK/-/-/DEPLOC:KFU/23262AUG/ARRLOC:KFT  
ARRIVAL DATE REQ# MSN # MSN TYPE DEPART T/O ARRIVING  
T SS T/SS/MAAPTR AMC HOUSE DINGO SS/DINGO DINGO  
 /2315367AUG//  
LAND  
SS/DINGO

MSNACFT/2/ACTYP:EISE/LIZARD25/4631V3AZAW/-/LD25/-/A:123/-/B:2715  
MSN ACFT # ACTYP C/S LOADOUT CLS FREQUENCY  
T SS/DINGO SS/DINGO SS/DINGO SS DINGO/SPIN3  
 /-/B:37125  
ALWAYS DATA MINI ANSWER ARRIVE

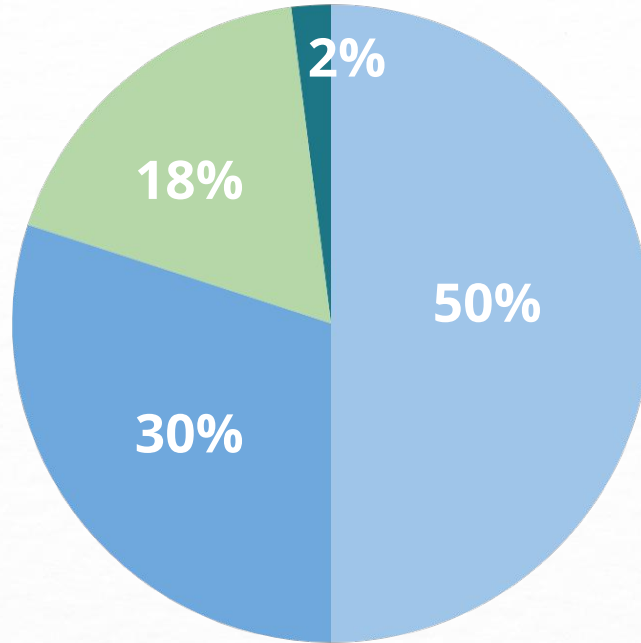
GTGLOC/PI-/NET:231400ZAW/MLT:231405Z/RANGE 76 AIRFIELD  
ATTACKING GRID STRIKE WINDOW TGT FAC NAME  
T/RANGE/TAPAS TAPAS TAPAS  
 /ID:1234x09876MP00/MFACFT/ACFT MAINTENANCE FACILITIES  
BEAR TAPAS OSURE TGT TYPE JORI DESC  
TAPAS TAPAS TAPAS  
 /DMEIT:3715.0000N 11645.0000W/WE/5541FT/7601/-/DESTROY  
SUPI LOC ELSVATION CONV TGT ID PR DESTROY  
TAPAS TAPAS TAPAS TAPAS TAPAS  
 ASUPTBY/ESC/390 FS/F107/EAGLE07/EE072/ACTYP:F15C/PFR0  
SUPTBY TYPE UNIT MSN # C/S SS SS SS SS/DINGO FREQ  
SS SS DINGO MAAPTR/SS/T SS SS SS DINGO SPIN3  
 /SFREQ:121.5//

USMTF: difficult to de-code & re-write

# Share of existing airspace library

## 50% “Forever”

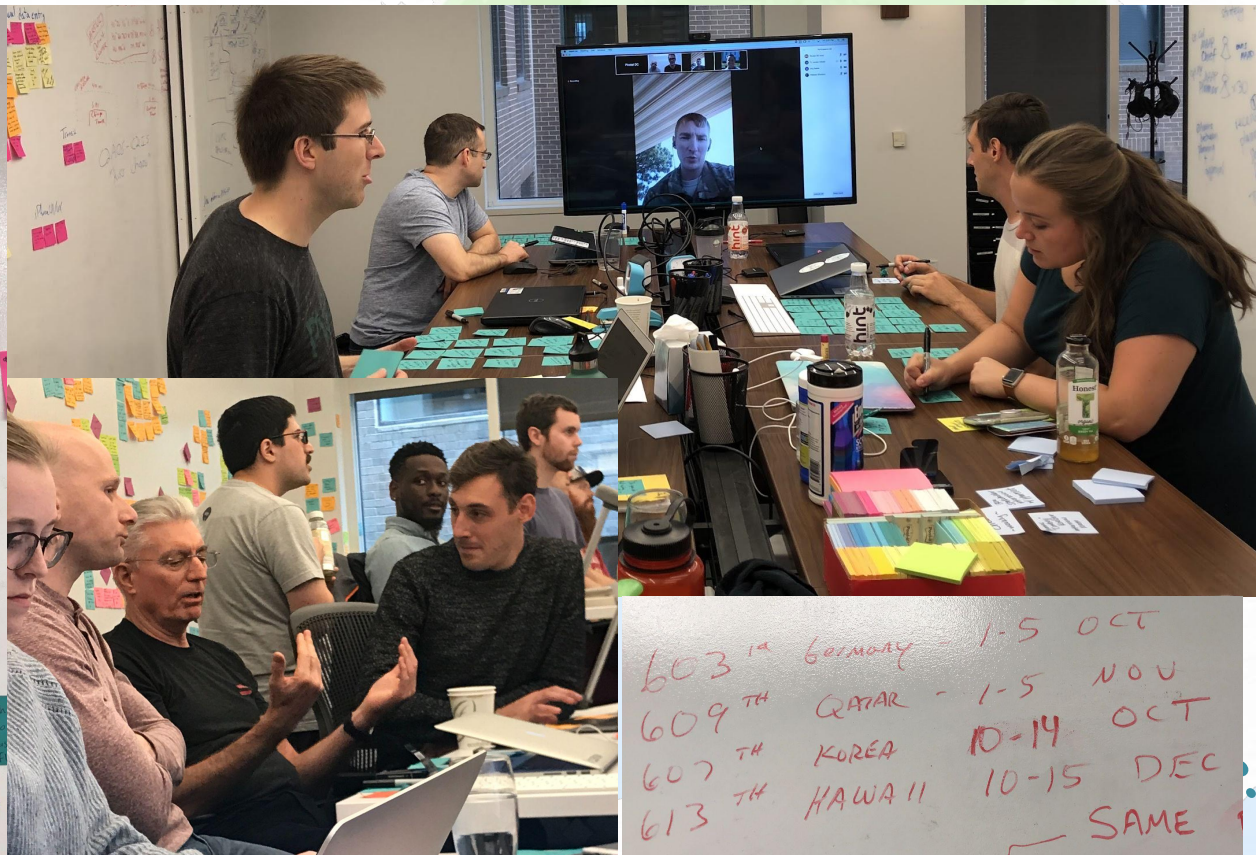
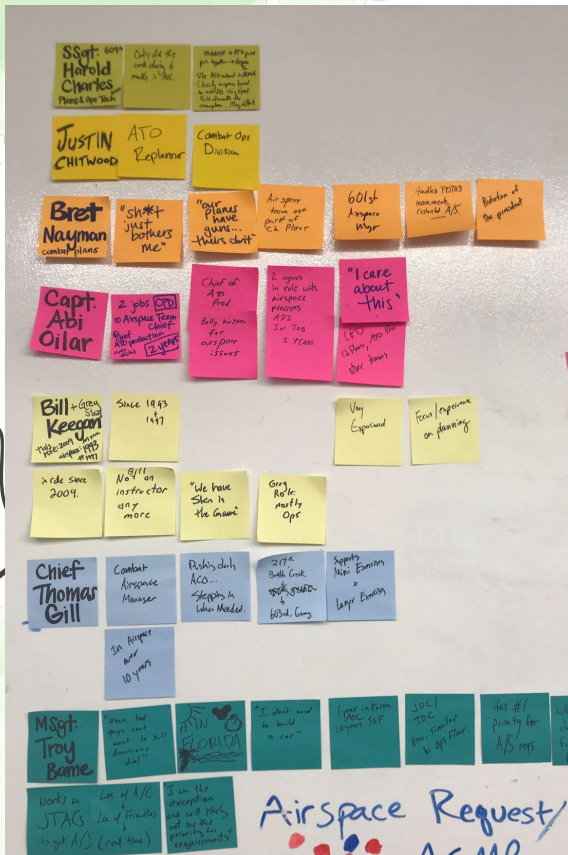
Airspace that will exist continuously  
example: a No-Fly-Zone over the White House



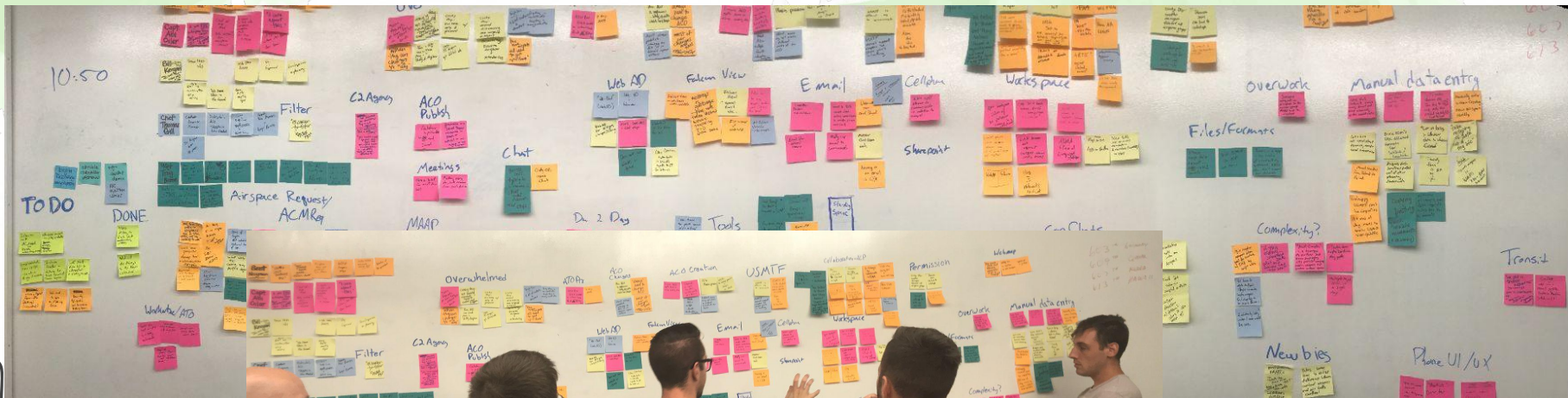
**30% Active yet cold**  
example: a recurring mission airspace that is no longer used but was never deleted

**18% On & off**  
example: a recurring airspace for military exercises run weekly on T/Th

**2% Single use**  
example: a single airspace for a one-time flyover



Interviews with Airspace Managers



Tons of information to synthesize

# Major Interview Takeaways

There are many tools to manage airspace, some more efficient than others. When time is of the essence, Airspace Managers will find a way (or make their own).

- WebAD is most reliable from start to finish, Falcon View has the best map, and ASMA-FP is more modern and better liked due to USMTF import ability (less coordinate hand-jamming required), when it works.
- Airspace Managers need tribal knowledge to recognize acceptable conflicts, eg. ground level and border buffers.
- They use many tools (email, phone, voice, and chat) to communicate inside and outside the AOC.
- Airspace “clean-up” or removal doesn’t happen often. An AOC could have ~1,000+ airspaces planned but only ~200 in use.

“WebMap is garbage... we use Falcon View.”

“I have received airspace requests handwritten on a napkin...”

“We make backups to backups to backups...”

“I know there’s an acceptable conflict when I build it.”

“Take retyping data out of my life.”



## Goals & Needs

Things our user wants to accomplish and inputs needed to accomplish those things

- Make sure missions have A/S
- Social interaction and ability to get away from work
- Occupying mental energy
- Getting it right, quickly
- Enriching myself while getting while TDY



## Behaviors & Motivations

Things our user wants to do and the reasons they do what they do

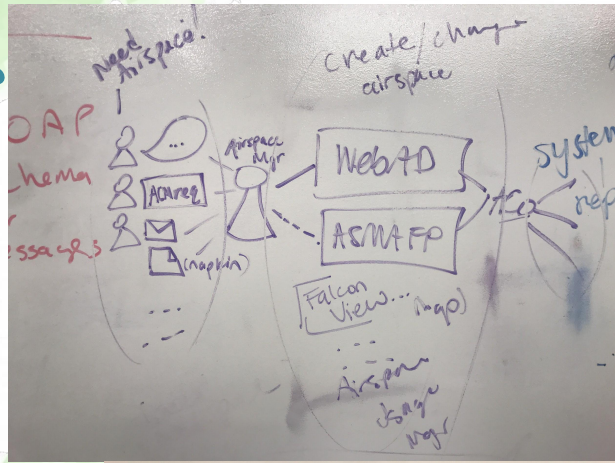
- Attend meeting and briefings to understand whats going on
- Wants to help in a crisis and feel valuable
- Often bored
- Runs around to coordinate with others
- A lot of externally imposed anxiety



## Frustrations

Things our user has to deal with that make them unhappy

- Short training makes competence difficult
- Slow work process
- Network issues and no mobile devices
- Hours are long
- Life is the same everyday
- TDY can be hot, dirty, and gross



# Problem Statement

AirSpace Managers have a problem parsing airspace requests that come in a wide variety of different formats (eg Cocktail Napkins) = This leads to lots of time-consuming, error-prone **HAND-JAMMIN'**

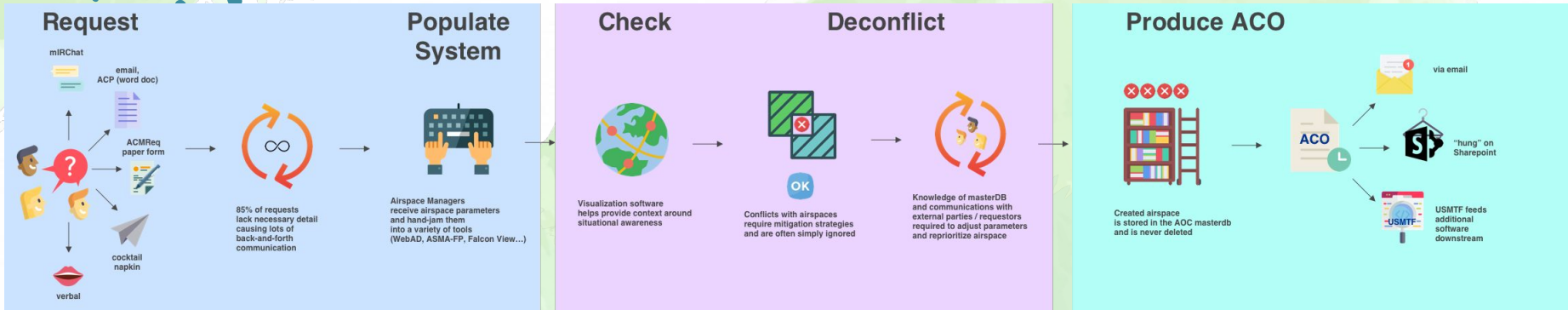
requesters come in with just altitude ~~and~~ and time to activate an airspace

15% of the time I have what I need

Less than 3 minutes to build airspace with all info provide

often just coordinates

The biggest problem / opportunity immediately became clear



Visualizing the proposed changes

# Our hypothesis

*We know Airspace Managers have a problem parsing airspace requests that come in a wide variety of different formats (cocktail napkins, etc.) - this leads to lots of time-consuming, error-prone hand-jamming.*

By **standardizing the request submission process**

and by **providing automated deconfliction suggestions,**

we believe **requesters** can **save deconflicted airspace on their own,**

**increasing speed to ACO prod** and **saving time for airspace managers** to solve more complicated problems.

We'll know we're correct when we can determine... (next slide)

# How will we know we'll be successful?

## Things that negatively impact time to create airspace that shouldn't:

- Avoidable Conflicts (airspace saved/submitted with known conflicts, % of airspace requests denied)
- Incomplete Requests (# of submission attempts without completed fields)
- Unnecessary back/forth conversations (user feedback)
- System instability (tracking downtime)

Best case scenario, the whole process only takes 3 minutes.

When it doesn't, it can take up to 40 minutes...

# Simplified Strategy

**All military branches need information on scheduled mission airspaces without conflicts**

## **Validate airspace requests at point of submission**

All required information is included in initial submission, eliminating the need for back-and-forth clarification about mission details and scheduling conflicts

## **Simplify deconfliction**

Automate slight airspace modification suggestions in location, altitude, and time for requesters to deconflict on their own

## **New airspaces are immediately usable**

Airspace entries are added to library and exported to all military branches as USMTF

## **Huge time save for Airspace Managers**

Airspace managers can spend the majority of their time managing complex critical mission conflicts

# Problems → Goals and Hypotheses

## Cleaner requests will save lots of time

People who need airspace can better prepare to make requests

## Compatibility with existing systems

If we can export our new library in USMTF it will still be legible and usable downstream by other military branches

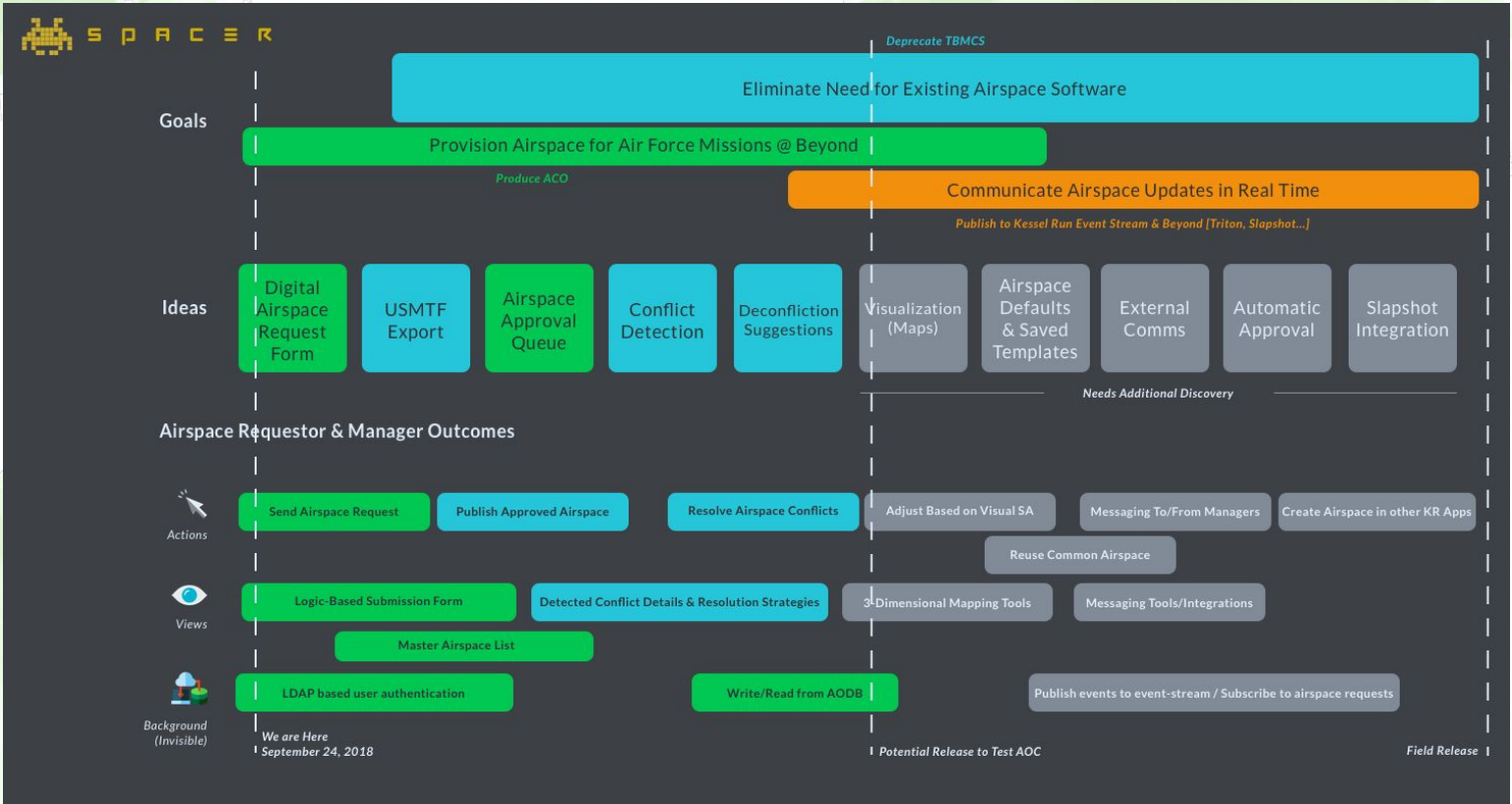


## Make deconfliction less complicated

Conflicts will be quicker and easier to manage if we can suggest slight adjustments in location, altitude, and time

## Archive legacy / stale airspace

Help to create a more accurate "theater picture" to clarify true vs. "fake" conflicts, allows for more context and easier prioritization in deconfliction



# Our initial roadmap



Requestor Logout

### Airspace Request

Platform

Requestor Logout

### Airspace Request

Platform

Type

Usage

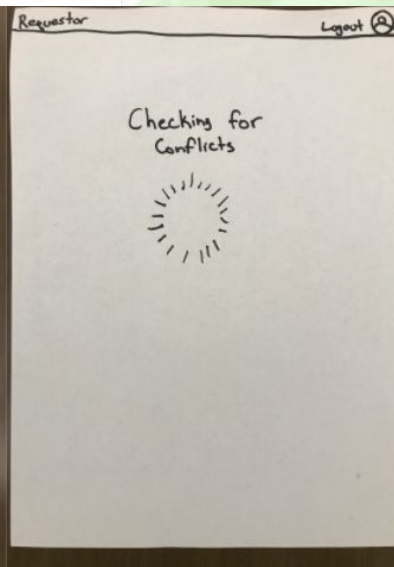
Shape

Altitude  -

LAT 1  LONG 1

LAT 2  LONG 2

Width



Requestor Logout

### 1 Conflict Found

Solved by moving orbit  
10NM NW

[More info](#)

New Airspace Request

Platform

Type

Usage

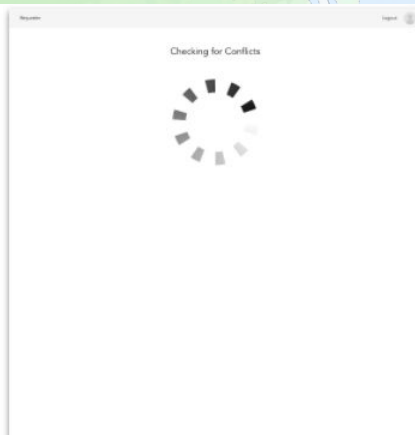
Date and Time

Shape

Altitude

Lat

Long



1 Conflict Found

How would you like to resolve?

Lower altitude  
1000 ft

Requestor altitude  
19,000 - 21,000 ft

Requestor altitude  
20,000 - 22,000 ft

[More info](#)

Move airspace  
2NM NW

[More info](#)

Push up time  
2 hrs

Requestor altitude  
1500s - 2000s

Requestor altitude  
1700s - 2200s

[More info](#)

### Airspace Request Pending

✓ Successfully Sent

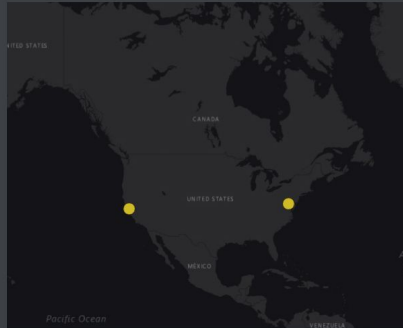
An Airspace Manager will contact you when your request has been accepted, denied, or requires further coordination. If your request requires an immediate response, please contact caoccpairspace@afcent.af.smil.mil

### Request Details

KirkJerk | Special Corridor - SC

⚠ Your request conflicts with another airspace. An Airspace Manager may contact you to resolve this conflict.

- Date and Time** 08 Mar 19 1200Z to 09 Mar 19 1200Z
- Shape** Line
- Coordinates** 37.781768 -122.403900 DD 38.901585 -77.037524 DD
- Altitude** 15000 ft MSL to 25000 ft MSL
- Requester Info** Kate, Product Manager VOSP Pivotal SF
- Comments** I just wanna see the map :)



REQUEST ANOTHER AIRSPACE



### Requested Airspace Details

Name	Shape	Usage	Start Date	End Date	Altitude
<b>Leonardo</b>	Line	DEF	10 Oct 18 - 0000Z	31 Dec 18 - 2359Z	0-50000 ft
Lat Long 1 40.7831, 73.9712	Lat Long 2 40.7128, 74.006	Lat Long 3 null, null	Lat Long 4 null, null		
<b>Michelangelo</b>	Polygon	ISR	10 Oct 18 - 1500Z	21 Jun 19 - 1630Z	500-5000
Lat Long 1 40.6782, 73.9442	Lat Long 2 40.7128, 74.006	Lat Long 3 40.7282, 73.7949	Lat Long 4 null, null		
<b>Raphael</b>	Point	CAP	29 Oct 18 - 0000Z	01 Nov 18 - 1500Z	12000-12000
Lat Long 1 40.7128, 74.006	Lat Long 2 null, null	Lat Long 3 null, null	Lat Long 4 null, null		
<b>Papa India Victor</b>	Circle	CAP	01 Apr 19 - 0000Z	02 Apr 19 - 0000Z	12000-22000
Lat Long 1 38.9072, 77.0369	Lat Long 2 null, null	Lat Long 3 null, null	Lat Long 4 null, null		

Development begins



Spacer

Logout of Eeyore



## Recently Used Airspace

+ Request New Airspace

Name	Shape	Last Used	
Papa Chevy	Circle	30 Sept 2018	Reuse
Tango Juliet	Polygon	12 Sept 2018	Reuse
Griggsy	Line	02 Sept 2018	Reuse
Red Weasley	Circle	28 Aug 2018	Reuse

## **Introducing a new process for “requesters”**

People who did not previously need to understand airspace details had to learn more to officially submit complete requests → we tried to help as much as we could with validation and helptext

## **Dampened stakeholder expectations**

A “smart” request form wasn’t the gorgeous 3D shapes-on-a-map that our stakeholders were hoping for... → it took some time to explain our aim for innovation vs. just UI modernization

# **Risky Assumptions & Challenges**

## **Trust in auto-deconfliction**

Airspace managers and requesters alike were initially hesitant to accept the system’s deconfliction suggestions - especially without conflict context for airspaces they weren’t previously aware of

## **~ Easy path to adoption**

Air Force generals were wary of our quick delivery process and weren’t ready to immediately abandon the old system and trust our “new” library

# Other Notable Problems & Opportunities

- **Accessibility of new request form:** Lots of requesters = lots of environments to make new airspace request form available
- **Lack of widespread airspace knowledge:** Requesters often not immediately prepared to fill out the airspace request form - barrier to entry
- **Legacy airspace library:** Validating airspace created long ago by humans no longer in the military and carrying over to new airspace library
- **Assisting with scheduling:** Recurring vs. one-time airspace (hello, google calendar)
- **Integrating with the rest of the TBMCS replacement suite of apps:** actual mission planning & squadron scheduling happened outside of our flow...
- **Trust in process change:** Hesitation towards eliminating the existing approval process

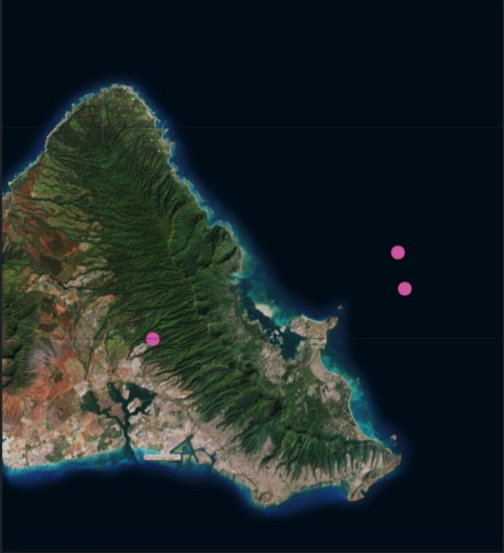
Where do you need this airspace?

Coordinates  
 MGRS  Decimal Degrees  Degrees Minutes Seconds  
ex: 12.3456, -123.4567

### Confirm Request Details

Script-Generated-1551371539931 | Free Fire Area - FFA

🕒 Date and Time	01 Mar 19 0446Z	to	Indefinite
📐 Shape	Polygon		
📍 Coordinates	3 KM 21.4350583803 -157.9386323902 DD 21.5292638754 -157.6523291526 DD 21.4899071195 -157.6443202132 DD		
⬆️ Altitude	0 ft AGL	to	51000 ft MSL
📞 Requester Info	-Script-v1.2 populate-request.js 609th testing		
💬 Comments	Populated by script 28 Feb 2019 16:32:19 <a href="#">See instructions.md in Spacer</a>		



[EDIT](#) [SUBMIT REQUEST](#)

Are there any transient instructions?  
What is the intended use of this airspace?

Populated by script 28 Feb 2019 16:32:19  
[See instructions.md in Spacer release artifacts for more](#)

Post-production releases...

# Onsite Adoption Challenges

## 609TH AWARENESS OF KESSEL RUN

**ASSUMPTION:** Senior 609th AOC Leadership was well aware of and aligned with Kessel Run as an organization, a portfolio of applications, and the ethos of Lean and Agile. Senior 609th AOC Leadership was educated on KR development, the KR app ecosystem and had full awareness and support.

**REALITY:** Not only did 609th Leadership request individual trainings of Slapshot, but also required lengthy Kessel Run organizational discussions – running the gamut from KR portfolio overview, various KR application questions / grievances, KR goals, KR financial inquiries – all prior to allowing Slapshot to be utilized or endorsed.

**MITIGATION:** The Slapshot team attended, represented, and spread the gospel of Kessel Run development in extensive (and duplicative) meetings with senior AOC leadership such as the CAOC Director, the DCFACC, several Directorate Commanders, and various CAOC leadership personnel.

**ASK:** KR leadership goes onsite to 609th to engage with AOC Senior Leadership: CFACC, DCFACC, CAOC Director, Battle Cab, and other senior officers. The AOC leadership is onboard with KR's innovative products and understands the goal of bringing the AOC into the 21st century. However, due to the transient nature of AOC leadership (turnover can be from 6 months to a year), the more we keep them at bay without direct buy-in from KR Leadership, we risk buy-in fading and losing context with leadership.

**Adoption =  
Awareness & Trust**

## ONBOARDING

**ASSUMPTION:** Onboarding new Slapshot users was an efficient, seamless process that required little overhead management from Slapshot PMs.

**REALITY:** The Slapshot team had to fill out over 150 individual PDF forms for each user prior to granting access from EACOMMs to the Slapshot application. Many of the forms were returned for “corrections” which were time-consuming, tedious, and in the grand scheme would not affect security nor performance of AOC operations.

**ACTION:** The Slapshot team worked with Major Smith to establish distinct Slapshot app user groups. When a new 609th individual arrives and they work for A32, they should then easily gain access and permissions to the appropriate applications (i.e. Slapshot, Marauder, Spacer, etc).

**ASK:** Inform KR PMs to share out directorates (user groups) they believe their apps should grant access to in order to allow ADs to organize users correctly –or– develop a shared Kessel Run FRAGO template so KR product teams can easily draft and disseminate to Kessel Run leadership for CAOC Director sign off.

## TECHNICAL APP SUPPORT

**ASSUMPTION:** The onsite Slapshot team has the bandwidth to act as a fully functional and continuously available User Support and Technical Support team.

**REALITY:** The onsite Slapshot team did not have the bandwidth nor the capability (due to time zones and weekends) to be the User Support team nor sufficient Technical Support problem solvers.

## MITIGATIONS

The Slapshot team ran three “Fire Drills” with the state-side dev team and worked with Major Matthew Smith for interim solutions if issues should occur. PMs built rapport with the 609th Platform team to cover gaps. However, the lack of KR representation onsite continues to increase KR portfolio risk and Slapshot product risk.

**ASK:** Hire at least one permanent-party contractor (owned by KR) to be the liaison between users and the 609th Platform team. This is especially relevant when a 609th KR user panics, perceives the app is broken or down, and the cause was merely the 609th EACOMMs Help Desk doing a clean-up (deletion) of users from the app group. This happens on a frequent basis (and is not announced, possibly due to cyber security inspections).

**Authentication  
& Access**

**Production  
Support**

# Some key learnings



## Managing process change is hard

- Map out every step (*event-storming is great!*)
- Learn the lingo
- Empathize with key players
- Test prototypes early
- Over-communicate plans & releases



## Mobilize early adopters

- Setup recurring feedback loops
- Help them help you with evangelization
- Quotes, soundbytes, feedback from users has a much greater impact



## Sometimes stakeholders need to win

- Align on expectations early
- Show your work - explain decision-making often
- Weigh trade-offs
- Compromise if possible



# THANKS!

Do you have any questions? Comments?  
[hello@kategrix.com](mailto:hello@kategrix.com)  
(804) 543-6527

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