

Low Cost UAV Runways



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Why UAV Runways?



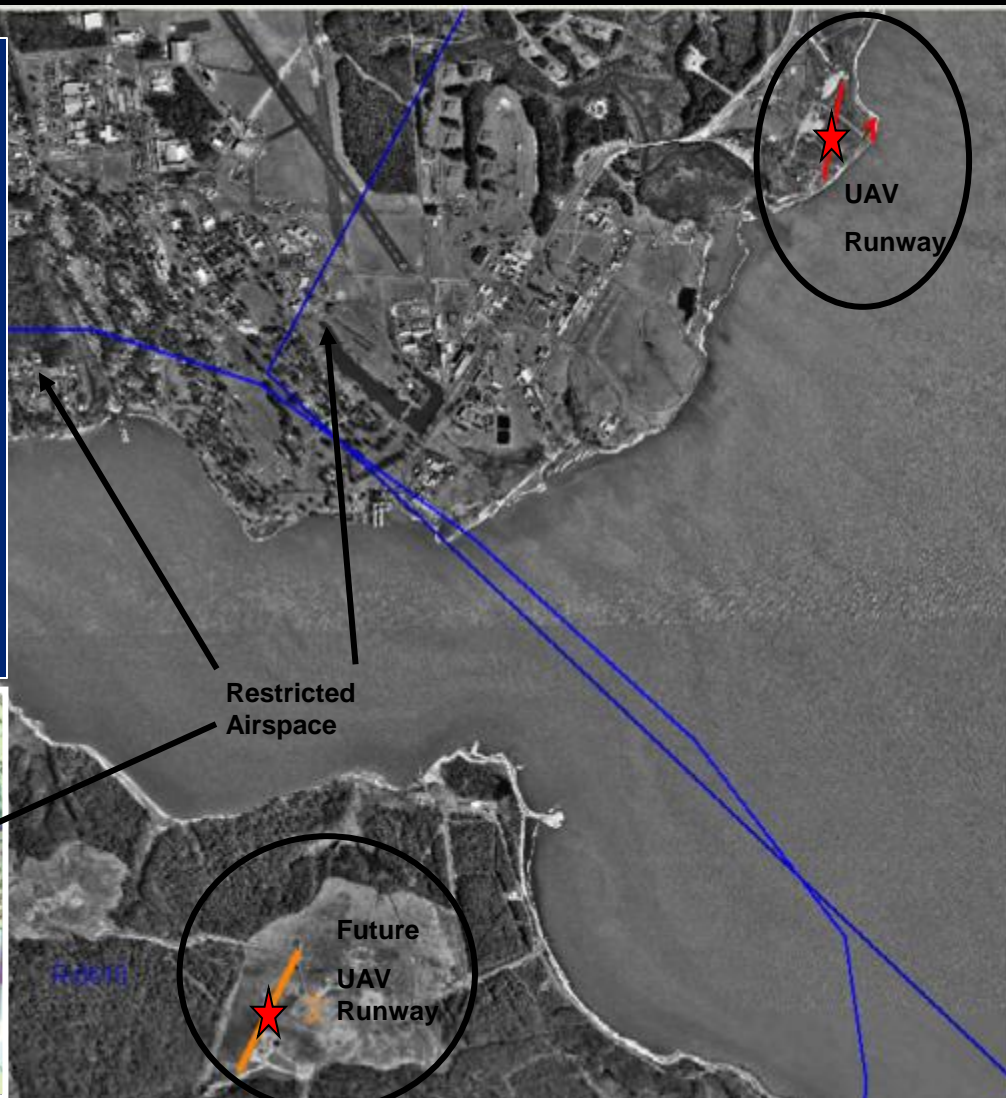
NSWC Dahlgren Base
Runway **outside the
Restricted Airspace!**

1. Launch & Land in Restricted Airspace (no FAA COA required)
2. Population or Building over-flight issues
3. Separating Manned & Unmanned Aircraft
4. Expeditionary Runways for Theater
5. Hazardous Testing at Remote Sites



Runway Siting

- Away from People and Property
- Within Restricted Airspace
- Minimal Terrain
- Minimal Obstructions
- Minimal Manned Air Traffic
- Align with Prevailing Winds
- Consider UAV Traffic Pattern
- Consider Environmental Factors
- Consider Required Approvals

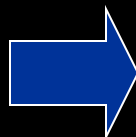


UAV Runway Surface Types

- Concrete
- Asphalt
- Expeditionary Mats and Grids
- Dirt
- Chip Seal
- **Geotextile ?**



Geotextile Runways



UAV



RC



- 1/4 the cost of Asphalt
- Can be expanded / re-configured
- Semi-Permanent
- 3-7 year life
- Permeable / Environmentally Friendly
- Can be paved later

Distribution Statement A

Runway Type Comparison

Type	Approx. Life (Years)	Approx. Max Wheel Load	Approx. Cost (UAV Application)
Concrete International Airport	20-30	>45,000 lb	\$ 38 /SY (4")
Asphalt National Airport	15-20	< 35,000 lb	\$ 18 /SY (2")
GFI Mats Military	15	<30,000 lb	\$100/SY
Dirt Private Airport	1	0-30,000lb weather dependent	\$ 2.75 /SY
Chip Seal NZ Light Duty Field	3-5	< 5,000lb	\$ 6.25/SY
Geotextile RC and UAV field	3-7	150 lb Tested (higher likely)	\$ 4.6 /SY

Geotextile Runway Life

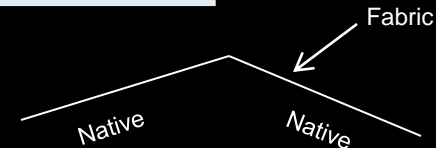
Construction
can be
Phased



1

**Fabric
on Soil**

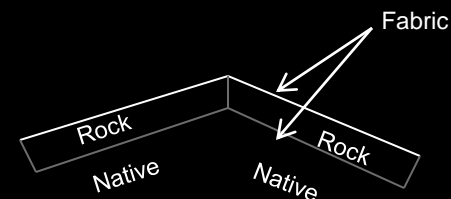
- 2-3 Year Life
- Expeditionary



2

**Fabric
on Rock**

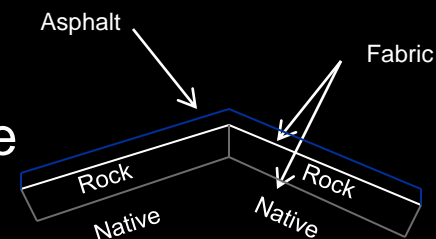
- 4-7 Year Life
- Semi-Permanent



3

**Asphalt
over
Fabric**

- 15-20 Year Life
- Permanent



Cost Example 1350 ft x 60 ft



Fabric
on Soil

- Clear, Grub and Roll:
 - 3 men, Dozer, Loader, Truck and Roller; 1 week= \$25,000
- Fabric Cost:
 - 10,350SY x \$1.85= \$19,000
 - 5 men 1 week= \$22,000
- Paint and Misc=
 - \$ 8,000

Construction Cost: \$75,000



Asphalt

- Clear, Grub and Roll: \$25,000
- Separator Fabric: \$5,400 + \$5,300 labor
- 6" Crushed Rock: \$55,000 + \$25,000 labor
- 2" Asphalt: \$160,000
- Paint , Drainage and Misc: \$ 20,000

Construction Cost: \$295,000

Planning CONUS

- Site selection
- Approvals
 - Base / Municipality
 - FAA
 - Environmental Permits
 - Other: Explosive
- Topographic Survey
- Geotechnical Report
- Design
 - Size
 - Orientation
 - Cut & Fill
 - Drainage (crown 1-2%)
 - Pavement Section
 - Striping
 - Plans, Specs Estimates
- Contracts and Bids

Planning Expeditionary

- Site selection
- Approvals
 - Base / FOB
 - Local Authorities
- Design
 - Size
 - Orientation
 - Striping
 - Drainage
- Organize Work Party



Planning Time: 1-3 years

Distribution Statement A

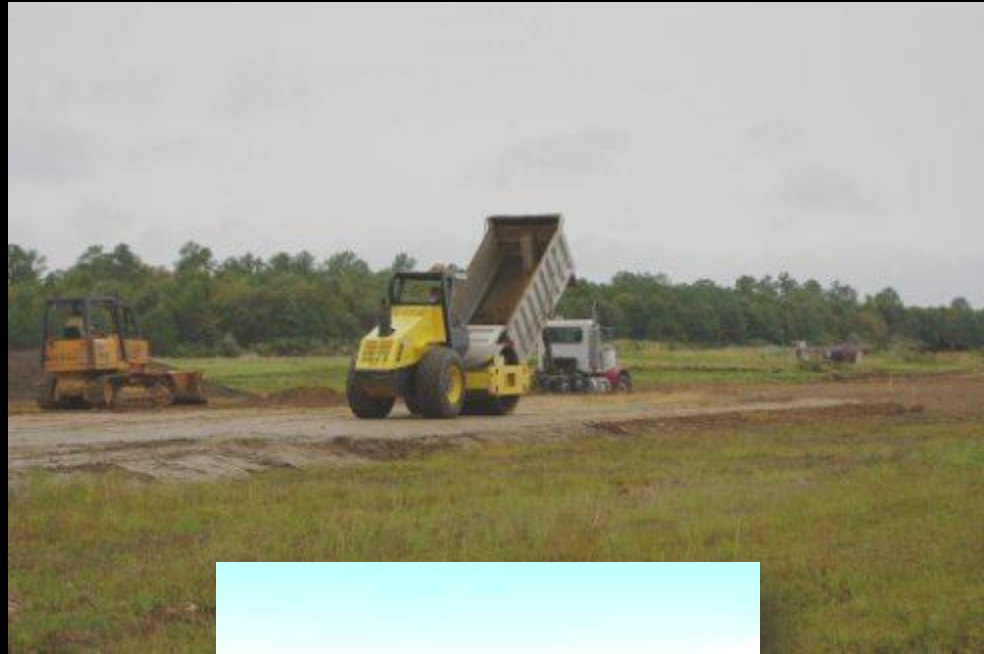
Planning Time: 1 month

Construction Steps



Construction Equipment

- Bulldozer
- Surveying Level
- Grader
- Roller
- Dump Trucks



Must have
at minimum**

Distribution Statement A

Construction Survey

- Transfers the design onto the ground
- Stake centerline
- Elevation stakes
- Survey Contract or simple \$300 level



Excavate and Compact

- Remove Organics
- Remove obstructions
- Prepare and compact sub-grade
- Herbicide to prevent growth
- Pipes (if required)



Build up UAV Runway Section Expeditionary

Fabric on
Soil



Staked US 230
Geotextile Surface

Graded & Compacted

Native soil

Build up UAV Runway Section Semi-Permanent

Fabric
on Rock

US 230 Geotextile Surface

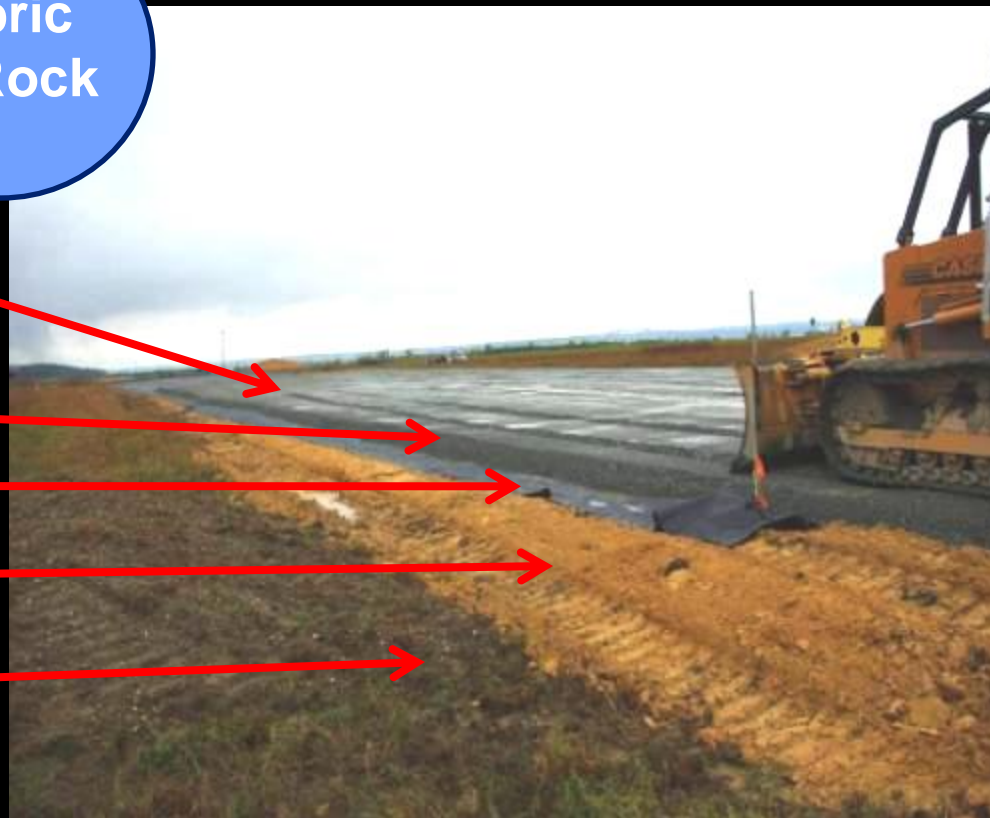
(not shown)

6" Crushed Gravel

US 200 Geotextile

Fill

Native soil



Placing Geotextile Surface

- Check for tears at Roll ends and remove
- Keep Rolls running straight
- Apply Tar on seams 6" min, 12" max overlap
- Anchor runway edges under rock if available



Staking Geotextile Surface

- Use landscape stakes or nails with washers on 1-2ft centers
- Fold horizontal seams and nail
- Do not pull fabric too tight. Leave some minor wrinkles
- Sun will heat and stretch surface 'drum tight'



Distribution Statement A

Striping the Surface

- Use Temporary X's
- Follow FAA Standards for Airport Markings
- AC NO.150/5340-1
- Do Not use Runway number markings. Use 'UAV' instead
- Use large 60' x 60' **Yellow** Xs every 1000' per AC 150/5340-1
- Standard Latex Road paint
- Paint 'Rotor Wing Prohibited' in 20' letters on center of runway



Final Touches

- Prevent Vehicles from driving on runway
- Remove Flight Obstructions
- Place Wind Sock
- Tar over Nails
- Seeding
- Access Ramps
- Electrical hook-up



Upkeep

- Walk Runway before every flight
- Remove debris and weeds
- Sweep if required
- Repair rips and tears with tar and patches
- Check for protruding Nails / Stakes



Questions ?

