

Cameron Park Airport Mowing Equipment Study

November 17, 2020

Process:

An Airport Mower Selection Working Group was formed composed of the Airport Manager and Airpark residence volunteers currently mowing the airport and conducting weed abatement. These volunteers have been serving many years and have direct experience in different types of mowers at the airport as well as experience in renting equipment and mowing services for the airport.

Airport Mower Selection Working Group members: Jeff Thornhill, Victor Garcia, David Becker and Kevin Cooksy. Terry Bohlen chaired the working group meeting on November 17, 2020.

The Requirements list was initially prepared by Terry Bohlen, then sent to the Airport Mower Selection Working Group for review prior to meeting. During the Working Group Meeting:

- 1) Requirements list reviewed, line by line, new requirements added specific requirements noted.
 - a. Mission and Cost Requirements drove Mower Requirements that then drove Tow Vehicle Requirements.
- 2) Mission and Cost Requirements must be met by any proposed solutions
- 3) Key Mower and Tow Vehicle Requirements assigned weighting factor
- 4) Considered types of Mowers against requirements for extended compliance
- 5) While not every requirement in the list was explicitly defined and documented, each one was at least qualitatively considered in arriving at preferred solutions.

Requirements

1 Definitions

Airport – In this document, Airport is Cameron Park Airport.

Airport Mowing Area – The area within the Airport Boundaries that are relatively flat areas, without large rocks and obstacles, where a mower can reasonably operate to cut grass and weeds without. Does not include ditches and other areas where a mower cannot reasonably safely operate.

Mowing Event – One complete mowing cycle of flat areas of the airport, not including cutting weeds in the ditches, spraying.

Mowing Event Time – Time to complete one mowing event, not including, refueling, any unexpected repairs, and operator breaks.

2 Mission Requirements

2.1 Area to Mow

Approximate Areas						
Airport Area		Runway		Mowing Area		
				Area	Sq-Ft	Acres
Length (Ft)	6,050	Length (Ft)	4,051	Airport Area	1,966,250	45.1
Width (Ft)	325	Width (Ft)	50	Runway Area	202,550	4.6
Area (Sq Ft)	1,966,250	Area (Sq Ft)	202,550	Mow Area	1,763,700	40.5

2.1.1 Flat area

Mower and any tow vehicle shall be capable of cutting grass and weeds in the flat and relatively smooth areas, both level and slopes within the airport area.

2.1.2 Ditches

While desired, the mower is not required cut weeds in ditches to the same height requirement as mowing in flat areas.

2.2 Sprayer Towing

Any tow vehicle, should be capable of towing the spray rig

2.3 Skill Level(s) to operate

Mower and any tow vehicle shall be capable of being safety operated by designated airpark volunteers with reasonable skills.

2.4 Time to Mow

Mowing time should be no more than two days to complete

2.5 Number Mow Events per Year

Mower and Pull Vehicle shall be capable of at least four mowing events per year

2.6 Mowing Seasons

Mower and Pull Vehicle shall be capable of mowing in February/March after raining and the ground has dried to a minimum of damp without causing deep ruts. Mower and pull vehicle shall not be required to mow only when the ground is dry and hard.

3 Costs Requirements

3.1 Purchase

3.1.1 Capital Cost

The capital / purchase cost shall not exceed \$5,000, assuming purchase in 2020.

3.1.2 Recurring Cost

Estimated recurring cost per year, including but not limited to, oil changes, other maintenance, replacement parts and repairs should not exceed \$200. This assumes one oil and lube and replacing about 25% of the cutting blades.

3.2 Rent

The rent option should not exceed \$700 per year or \$125 per Mow Event based on the number of Mow Events per year specified in 2.5.

Rental requirements based on the requirements and calculations below.

Buy		Requirement Source
Capital	\$ 5,000	3.1.1
Maintenance Cost per year	\$ 200	3.1.2
Service life	10	5.1.7
Cost over service live	\$ 7,000	
Rent		
Rental per year	\$ 700	
Number of Mows per Year	4	
Rent per Mow	\$ 175	

4 Mower Requirements

4.1 Time to Mow

The time to complete a mowing event, should be no more than 20-man hours

Weighting

- 25-30-MH - weight 4
- 20 MH – weight 5
- 13 to 19 MH – weight 6
- 10 to 12 MH – weight 9

4.2 Grass/weed thickness

Mower shall be capable of cutting grass and weeds up to 3/8 -inch diameter.

4.3 Grass/weed cut height

Mower shall be capable of cutting grass and weeds to the minimum height when the weeds are 24 inches.

4.3.1 Fire Break Cut Height

The mower shall be capable of cutting the grass and weeds to one-inch or less.

4.3.2 Mower Height Adjustment Range

The mower shall have a low height of 1-inch or less, and should have a high end height of about 4-inches or more.

4.4 Cutting on slopes

The mover with tow vehicle shall be capable of safely operating and cutting the grass/weeds to the minimum specific height when operating on the slopes in the airport mowing area, both up and down the slopes and perpendicular to the slopes.

4.5 Cutting ditches without going perpendicular to ditch

Mower is not required to reasonably and routinely be required to cut the weeds in ditches.

4.5.1 Offset(s) / Reach

Mower is not required to be capable of offsetting from the tow vehicle centerline.

4.6 Rock/Debris Throwing

The mower shall have provisions to mitigate rocks from being through out of the mower such that rocks and debris could cause 1) hazard to the tow vehicle operator and 2) through rocks and debris on to the Runway, Taxiways and aprons.

4.7 Tracks in soft/wet ground

The mower should not make tracks or ruts in soft/wet ground of more than about 0.5-inches. Soft ground is defined as ground that can be walked on without or very little indentation in the ground wet

4.8 Durability

4.9 Maintainability / Serviceability

4.9.1 Maintainability

4.9.2 Replacement Parts Availability

4.9.3 Parts Cost

4.9.4 Cutting part cost

4.9.5 Safety

4.10 Service Life

The minimum service life is 10 years. Service life is defined as the time before the equipment maintenance becomes significant and much more expensive to keep the equipment safely operating.

4.11 Operations

4.11.1 Cutting Height Adjustment Simplicity

The mower cutting height should be easily and quickly adjustable by the operator from the operator's seat on the tow vehicle.

4.11.2 Hook up / Connection to Tow Vehicle Simplicity

The mower should be reasonably simple and easy to connect to the tow vehicle.

4.11.3 Cutting in Ditches

Regular cutting in the ditches is not required

4.11.4 Training

4.12 Derived Requirements

4.12.1 Mowing Width

Minimum mowing width should be 6 feet

5 Tow Vehicle Requirements

5.1 Tractor with PTO

If mower requires Power Take Off (PTO), then the tow vehicle shall have PTO.

5.2 Two vs. Four Wheel Drive

2WD minimum

5.3 Tracks in soft/wet ground

The mower should not make tracks or ruts in soft/wet ground of more than about 1-inch. Soft ground is defined as ground that can be walked on without or very little indentation in the ground wet

5.3.1 Tire Widths

Tire width, shall be large to meet the requirements in 5.3 when cutting in Feb/Mar

5.3.2 Fuel

The fuel should be Diesel or Gasoline

5.3.3 Visibility of mower deck from operator seat

Visibility from the operator's position to the back of the tow vehicle to observe the mower shall be sufficient to assess the cutting status of the mower

5.3.4 Maintainability / Serviceability

5.3.5 Maintainability

5.3.5.1 Replacement Parts Availability

Common Replacement parts for the tow vehicle and mower should be readily available from sources in the United States

5.3.6 Service Life

The minimum service life is 10 years. Service life is defined as the time before the equipment maintenance becomes significant and much more expensive to keep the equipment safely operating.

5.3.7 Safety

5.3.7.1 Roll Over Protection

The tow vehicle shall have or be capable of having factory engineered roll protection hardware installed.

5.4 Insurance

The tow vehicle should be covered on the existing Airport insurance policy

5.4.1 Operations

5.4.1.1 Operator Comfort

5.4.1.1.1 The operator seating position and immediate area, should be comfortable for seating for several hours by the typical operator at the Airport.

5.4.1.1.2 The seating area should have shade from the sun, at sun angles expecting during a cutting day.

5.4.1.1.3 The operator should have access to at least one drink holder that can hold a drink when operating on the Airport. The drink should not fall out when the two vehicle is on rough ground at the Airport

5.4.1.2 Operational Simplicity

The tow vehicle should be capable of being safely operated by a driver/operator with the skills specified above.

5.4.1.3 Operating on slopes

The tow vehicle with mower shall be capable of safely operating and cutting the grass/weeds to the minimum specific height when operating on the slopes in the airport mowing area, both up and down the slopes and perpendicular to the slopes.

5.4.1.4 Training

Training to safety operate the tow vehicle, with the mower attached or with any other attachments that may be used on the tow vehicle, should be able to be conducted by a designated person at the Airport to volunteers with skill sets defined in requirement 2.3.

5.4.2 Service Life

Minimum service life is 10 years.

5.4.3 Non-mowing Uses

The tow vehicle should be capable of towing a trailer and box blade scrapper.

Solutions Considered

1 Solutions - Separate

1.1 Mowers

1.1.1 Self-Powered

1.1.1.1 Flail

Prior experience was that a Flail mower at the airport did the best cut.

Weight 8

1.1.1.2 Rotary (Busch Hog)

Weight 5

1.1.2 Mower Requiring PTO

1.1.2.1 Flail

PTO allows greater mower width, reducing time to mow.

Weight 8

1.1.2.2 Rotary (Buch Hog)

Weight 5

1.2 Separate Mower / Cutter for Ditches

Separate walk behind and/or handheld cutter can be used for cutting in the ditches.

1.3 Tow Vehicles

1.3.1 PTO Tractor

1.3.2 Non-PTO Vehicles

Options Considered

1. Purchase Mower and Tractor Now
2. Rent, try out, then Purchase Mower and/or Tractor
3. Rent
4. Hire Service

Past Experience

1. Rented service, very expense,
2. Best cut was with Flail Mower

Derived Requirements and Solution

Result from Mower Selection Working Group Meeting held November 17.

During the course of the meeting we went through requirements, assigned weight to key ones.

Went through generic solutions

South end will be graded, rocks cleared to allow normal mowing, in about two months by friend of David Becker.

Discussed purchasing, renting equipment and hiring service. Renting clearly more expensive and quickly exceeds available budget after several mowings. *Provide cost comparison* Poor availability of rental equipment, especially a mower was a factor.

Key requirements Summary:

- Mowing time: about 20 Man Hours (MH) per mow. Drives width from 4-ft (30+ MH) to 6+ feet, 20 MHs. Drives tractor minimum HP of 30 to 65 HP. Lower end ok as we do not have steep hills.
- Ability to mow after rain with reasonable dry time, without significant ruts. Drives weight and width of tires, allows mowing in Feb/Mar. Narrow tires limits mowing to one season.
- Cut low to be compliant with fire break requirements

- Ability to cut long grass and weeds
- Mower not required to cut weeds in ditches, at least normally. Weeds in ditches need to first be cut low and sprayed, a lot.
- Need to keep up with mowing and spraying. Means mowing 3 to 4 times a year. Plan on 4 times.
- Front loader not needed or desired
- 10-year service life
- Capital Cost no more than \$5,000.
- Use existing Swisher mower to supplement mowing and decreased mowing time. Swisher would be towed with volunteer ATV or airport vehicle.

Derived Requirements

- Equipment needs to be stored inside, out of the sun.
- Flail mower 6+ ft wide, PTO driven
- Tractor with PTO, 2WD ok, (4WD not required), minimum 30 HP
- Roll over protection - can add
- Shade: Cover or Umbrella mounted to tractor, which can be added.

Rotary vs Flail Mower

- Rotary
 - Good for large overgrown grassy areas. Can cut tall, thick grass with relative ease.
 - Can be run at relatively high speed (with enough power, i.e. PTO driving)
 - Compared to Flail Mower, lower quality of cut, potential for clumping and piling of clippings.
 - Simple to maintain; rotating flat blades
 - With rotary motion, object can be thrown in all directions (rock, trash, etc)
- Flail
 - Excel at cutting vines and brush. Great for heavily overgrown areas
 - Mulches cuttings and spreads evenly.
 - Linear cut reduces risk of throwing debris, making better choice for area with rocks
 - Can cut lower than rotary
 - Flail blades relatively simple to replace.

Dedicated tow vehicle (Tractor) vs. Multi-Use Airport Vehicle

In order to meet the mission requirements, a separate, higher power and more capable tow vehicle is needed. This vehicle would be slower and not economical to operate on a day-to-day basis, for quick runs down to a tie-down, or a runway check for example. If a smaller width mower was used, it could be towed by a ATV type vehicle, however during mowing, the vehicle not available for quick trips, etc. Also, the wear and tear on such a vehicle would be much higher than not using it for mowing, likely reducing its life and adding to down time for maintenance and repairs.

With a target of \$5000, the solution the group is pursuing equipment that meets requirements:

- 6+ foot Flail Mower, PTO. side shifting not required. Spray next to fences, etc, where the mower should not go.

Dave Becker has lead to find one, price target less than \$1,500

- Tractor. PTO, 2WD, minimum 30 HP, Good condition to last 10 years with maintenance

Victor has lead to find use one, price target less than \$4,000

- Storage shed. Suggested building one next to lighting shed. Dave Becker can build, with concrete floor. Jeff can provide volunteers. Shed should be permanent structure. Likely require County and CPSD architecturally code compliant with permits, power for lights and utility, perhaps large enough for other storage. Should consider finding temp storage until ready.