Turbo Charge That Flute

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This clinic contains two parts. A section on setting up a foot joint is discussed and the second section concerns identifying all the small hidden details that aid in maximizing the performance of a flute.

Flutists are required to slide their pinky to operate all the RH pinky keys of the foot joint. Improper setup will detract from ease of accomplishment if certain parameters are not set. Here is a guide for understanding and establishing these parameters for ease of playability of the foot joint.

Basic Geometry:

The foot joint levers should have two basic criteria

- The plane of the rollers and C# key should be roughly equal to the profile of the D# key
- The D# key should not be too low or too high. The height of the end post is a good guide for establishing the height of the D# lever.
- The profile of the D# key and Low C# key should resemble a "dove wings"

 Some keys are made this way and some are not. The idea is to approximate this basic idea to facilitate pinky slides (clinic demonstration)

Procedure:

Pad adjustments and setup usually go hand in hand. Adjusting the levers will often alter the cup profile and require additional pad seating.

1) Pad the lowest lever keys first, Low (B), C, C#
2) Regulate and adjust the Low C# pad with the Low C, Use only the thinnest silencing material for silencing. DO NOT rely on variable shim thicknesses to regulate the two together. Use one thickness (thin) and bend the lever. This will alter the key cup angle and balancing shimming with lever adjustment is needed.
3) Set key heights for these keys
   a) Select the same size bumper material for each foot and apply.
   b) Bend the tail properly (clinic demonstration) to establish a key opening of .135"
4) Pad D# key and adjust lever to a height even with the body post height. Do not deviate by a large degree from the plane of the previous (two or) three levers. The design of the instrument itself will guide you. Avoid extreme changes.
5) Once again, a balance between bending the D# lever arm and adjusting the pad will be necessary.

Dealing with problems:

If you've gotten this far, you will be reasonably setup in many cases. Some things might still be uncomfortable depending on the design.

- Rollers – Sometimes the rollers have sharp edges or are tilted up causing the pinky to hang up on them. These need to be smoothed and tilted (clinic demonstration)
- Low C# - D# key – These key should form the "dove's wing". If they are flatter keys without a nice shape, tilting them in towards the center slightly eases the finger sliding when they are profiled in this manner.
- Spring tension. The Low C# key should be the lighter than the others. If you adjust the spring tension after the pad work, you may need to go back and fine-tune pad adjustments.

ALWAYS check pad seating with a magnehelic. The low C# key should be checked by closing it with the low C lever. This will take into account what ever spring tension you have that might be causing flex to the key. Do not assume the pad seating on these keys is correct from pushing down the keycup directly. You must use the levers to close the keys and check for leaks.

Optimizing Flute Performance

There are many variables that affect flutes' performance. These include the bore profile, pad-seating system, venting heights, and headjoint properties. We will be concerned mostly with the bore profile, and pad seating system for our discussion.

Body Tubes and Toneholes

Flutes are most responsive when the bore is as precise as it can be. One particular area to check is the area where toneholes meet the bore. Manufacturers differ as to their treatment, if any, of the tonehole bottoms. Many times there is a really sharp edge. Rolling these edges in an almost undercutting procedure can make a flute more responsive. There is threshold based on many factors however, softening these sharp edges can improve responsiveness. An old flutemaker's trick is also to chamfer or soften a sharp edge at the end of the foot joint to add in responsive ness of local notes and the third register. Lastly, a highly polished bore will aid in responsiveness. The procedure is as follows:

- Round tonehole bottoms with a polishing bit or scraper.
- Polish bore (2000RPM) with Tripoli on a polishing mandrel (see demonstration)

Pad Seating Systems

Pad seating systems contribute to two aspects of flute performance: feel and performance. Proper setup contributes to positive feel and quick response. Leaks are the absolute largest cause of response problems in flutes. There are many places a flute can leak and there are many ways to find hidden leaks and repair them. These two functions are related but differ.

Specs for Pad Seating

- Level tone holes
- Deburr and thin rims (rims must be thinned to optimize finger pressure to seal ratio.)
- Set Pad exposure to @.015" (spud height equal to rim plane). Optimum tolerance is .015" compression.
- Adjust key angles to maintain pad compression.
- Seat pads precisely.

Sources of Hidden Leaks

There are many sources of hidden leaks that must be accounted for. If you have less than acceptable magnehelic readings, check this list to isolate particular problems.

- Use a magnehelic and isolator to gauge each individual pad.
- Use the whole tube as your final magnehelic test.
- Use a keycup isolator attachment to locate specific hidden problems. (see Diagram for tool spec)

Keycup Isolator Specs

- Anything less than a dead pin on the magnehelic meter with minimal pressure indicates a leak. When the whole tube is checked these will be magnified in the final reading.
- The isolator checks for:
    - Torn or worn out skin
        - Pad MUST be replaced.
        - Deburr keycup inside edge with scraper. This often tears the skin on the pad's side during the seating procedure.
    - Excessive washer or grommet compression (Felt tolerance tightened out of compression spec)
        - The washer is pressing too much on the skin or the felt is worm out and needs replacing.
        - Pad exposure is too great for spud height. Washer or grommet is compressing the cushion too much and cannot compress easily. Reduce foundation to improve compressibility and adjust cup angle. Replace pad if it has lost its compressibility.
    - In adequate washer or grommet compression (not sealing against skin)
        - Increase foundation and adjust key angle for seat
        - Newest JS gold pads require enough compression to seat on collar seat. Reduce grommet/bushing height.
    - Screw/grommet seals
        - Pad screw is not sealing against washer. Use a paper or plastic seal or wax to seal leak
        - Grommet not sealing on chimney. Wax or resize grommet for seal.
        - Grommet bottoming out on pad cardboard. Chamfer a relief cut on pad to give clearance for grommet bottom. This is the prime reason for bottoming out your grommets.

Final Checks and Setup

- When using a magnehelic, plug holes for final leak tests
- If you don't use plugs, wet your fingers to eliminate fingerprint leaks
- Regulation problems:
    - The vast majority of regulation problems concern over-regulation and/or pads hitting heavier in the back. The lightest finger pressure and spring tension will reveal these types of leaks and regulation problems.

Diagram: Mag attachment for keycup isolator