Brass Technique

The main goal of technique is to liberate us from the physical demands of our instruments so that we can be fully expressive. We do this by maximizing the mechanical efficiency of various playing related systems. These systems include sound production, flexibility, and articulation.

Sound Production

The goal of sound production on a brass instrument is manyfold. First and foremost, we wish to minimize the effort it takes to create sound. We also wish to maximize the resonance of our sound. A resonant sound has a clearly defined pitch and overtones. It has focus, projection, and clarity. Furthermore, we wish to balance the the overtone spectrum of our sound for the music we are playing. A sound which is too bright will not blend, and a sound which is too dark will not project. However, darkness and brightness should not be confused with resonance. We want sounds of all colors to resonate as much as possible.

The basic mechanics of sound production on a brass instrument are simple. We vibrate our lips into the mouthpiece which in turn excites a resonant frequency from our instrument. In order to refine our sound production we will closely examine each of its elements—breathing, embouchure, and resonance.

Breathing

At first it might seem silly to refine the breathing process. After all, breathing is a natural activity regulated unconsciously by our central nervous system. If we weren't efficient at breathing we would not still be alive. However, the way we breath when playing a wind instrument differs somewhat from how we normally would breath.

Breathing consists of two motions: inhalation and exhalation. For our purposes, we will need to consider each of them independently. In normal breathing, these two motions are mostly equal and opposite and will mostly occur through the nose. However, for wind playing the inhalation will tend to occur must faster than the exhalation, and most breathing will occur through the mouth. Opportunities to inhale air while playing music tend to be scarce. As a brass player, we will want to inhale air quickly, quietly, and as fully as possible in those opportunities. Our inhaled air becomes a scarce resource during our exhalation. We only have so much of it until we get the opportunity to inhale again. Therefore, it is important not to use it all up faster than necessary. Since lower and louder notes consume air more quickly than higher and quieter ones, we want to be prudent with shaping our phrases (both in terms of dynamic and tempo) to accommodate this.

Posture is intimately connected to the quality of our breath. It is important to sit or stand in a neutral way such that our center of gravity is evenly distributed around our spine so that we do not lean, even a little bit. If standing we should keep our feet about shoulder width apart and splayed slightly outward without locking the knees. If sitting it is important to sit on the front of the chair or stool with feet flat on the floor and knees about shoulder width apart. Always keep the arms out and away from pressing against the sides of our abdomen. This minimizes the amount of isometric tension in the muscle groups which immediately surround our lungs. It is important to note that our lungs are located beneath our ribcage and do not extend down to the bottom of the abdomen. As they expand to take in air, air moves equally in all directions to fill them just as it does when we inflate a balloon. As they expand into the chest cavity, everything immediately around them expands as well. The ribcage will stretch outwardly, the back will expand, the shoulders will subtly rise, and the abdomen will stretch out as the lungs push down on it from the top. It is important to stay as relaxed as possible to

fully allow for this expansion. Any isometric tension in the body near the lungs will make our inhalation less efficient. Common pitfalls to avoid are shrugging the shoulders, locking the kneck, tightening the lower abdominal muscles, leaning, and slouching.

Next we turn our attention to the glottis. The glottis refers to the opening between the vocal folds. The glottis closes somewhat as we engage our voice to talk or sing. However, for normal voiceless breathing it is completely open. We want the glottis to remain open while playing a brass instrument. Unfortunately, for some wind players it will inadvertently close during either the inhalation or exhalation. We can feel the glottis closing by slightly voicing our breathing. Once we recognize how this feels and sounds it can help us notice and eliminate it from both our inhalation and exhalation while playing.

The epiglottis is a flap of cartilage at the base of the tongue which covers the windpipe to prevent food or water from entering the lungs while swallowing. We also close the epiglottis when we hold our breath with our mouth open. It is important to become familiar with how this feels so we can notice it in our playing. It can unintentionally engage either fully or partially during the exhalation while playing a brass instrument. Any engagement of the epiglottis will add unnecessary resistance to our breathing and negatively impact airflow.

The soft palate is the soft muscle tissue at the back part of the roof of the mouth. It contains muscles fibers sheathed in a mucous membrane. Its main function is to close off the nasal passages while swallowing. While playing a brass instrument, it is important to keep the soft palate engaged in order to focus all of the airflow from our lungs to our mouth by preventing it from going into our nasal passages. We can notice the feeling of the soft palate opening and closing our nasal passages by comparing the sensation of blowing air out through the mouth to blowing air out through the nose. Once we notice this distinction, we can focus on keeping the soft palate closed while playing. Otherwise air will leak into the nose while playing, and we will lose our ability to intensify the airstream enough to play high or loud tones.

Last we focus on keeping the back of the tongue down while breathing. To know what this feels like we might pronounce the word “long” and hold onto the “-ng” part of it. Raising the back of the tongue, even just slightly, adds resistance to the airstream. We will notice it by the whooshing sound it makes during inhalation or the weakened air stream we observe during our exhalation. Always keep the back of the tongue in a neutral position, and keep the inhalation as silent as possible.

IN SUMMARY: *The main goals of breathing while playing a brass instrument are to sit with a balanced posture, eliminate isometric tension from the muscles which surround our respiratory system, and keep the air passageways open. Breathing while playing a wind instrument should always feel as effortless and be as silent as possible.*

Embouchure

The word embouchure typically refers to the specific formation of lips, facial muscles, tongue, teeth, and jaw necessary to play a wind instrument. A lot of brass players attempt to form their embouchure first and then blow to create a sound. However, this is usually a failed strategy. The formation of the lips changes entirely as soon as air starts to pass through them. This is because a brass embouchure can only exist when air is passing through it.

The main purpose of a brass embouchure is to regulate the mass of lip tissue that vibrates when a column of air moves through it. Higher pitches require less vibratory mass, and lower pitches require more vibratory mass. A good embouchure formation allows the lips to vibrate with a minimal air flow rate and intra-oral pressure. For our purposes, intra-oral pressure refers to the air pressure differential between the inside and outside of the mouth. The flow rate refers to the volume of air per second that passes through the embouchure. We know from simple experiments that as our vibrating lips ascend in

pitch the intra-oral pressure increases while the flow rate decreases. We know from these same experiments that as our vibrating lips crescendo louder on a given pitch that both the intra-oral pressure and flow rate increase.

The airstream is itself regulated by the embouchure. These relationships between pitch and volume to intra-oral pressure and flow rate are indirect consequences of the physics of the vibrating lips themselves. During vibration the lips oscillate from a more closed position to a more open position. The maximum amount of displacement of the lips during their vibratory cycle is called their amplitude. When the lips are vibrating, their vibratory mass is directly related to the frequency and their amplitude is directly related to their volume. The maximum open area during a vibratory cycle is called the aperture. The aperture can be made bigger either by increasing the amplitude or increasing the vibratory mass of the lips. It is the aperture that regulates the air flow rate versus intra-oral pressure. Therefore all of these concepts are directly related to one another.

Next we focus on how to position the lips and mouthpiece to create that efficient embouchure which vibrates with minimal airflow or intra-oral pressure. The lips must be positioned so that they can close during the vibratory cycle, only produce one aperture, and both vibrate at the same pitch. The distance between the lips is mostly regulated by the position of the jaw. We want to position the jaw so that the lips are just barely touching during the minimum of their vibratory cycle. If they are pushed too close together, it will result in a pinched forced sound. If they are held too far apart, it will result in an airy sound.

The size and shape of the aperture is regulated by the facial muscles. It is important to keep all the facial muscles surrounding the embouchure just firm enough to avoid puffing the cheeks or lips. If puffing occurs, there is not enough firmness for the embouchure to maintain a consistent shape while air passes through it. This will usually result in an unstable sound. However, it is also important not to use any tension in excess of what is required to prevent puffing. It is unnecessary and just causes the embouchure to fatigue more quickly.

We also want to focus our attention on the corners of the mouth where the upper and lower lips meet. If the corners are pulled out too far into a smile, the aperture gets stretched very wide and thin. The more this is done the more likely it is that multiple apertures will result, each vibrating at a slightly different pitch. It is therefore important to avoid smiling with the corners and maintain a single aperture. However, there is also danger in overdoing this. If the corners are pushed in too far into a pucker, a space will open up at the center of the aperture where the lips will no long touch during their vibratory cycle.

Additionally, we must acknowledge that the two lips are neither the exact same size, density, or elasticity. As a result, we will need to roll one lip back a little bit more than the other to get them vibrating at the exact same pitch. This position will deflect the airstream away from being perpendicular to the face. Most players will need to tuck the bottom lip behind the upper. They are commonly referred to as “downstream” players. Other players will need to tuck the upper lip behind the lower. They are likewise referred to as “upstream” players. There are many examples of highly successful players of both embouchure types. The ideal airstream direction is the one that evens out the vibrations in both lips. This balance point typically varies with register. Most players will need to deflect the airstream more as they ascend in register and less as they descend.

Finally, we must consider the placement of the mouthpiece. Our specific mouthpiece placement should balance two competing goals. First, the mouthpiece should rest flat against the face in a position which minimizes the amount of pressure against the lips that is necessary to maintain a hermetic seal. Second, the mouthpiece should be centered around the aperture. This second goal tends to lead to unexpected results since the aperture is not always centered in the middle of the lips and face. The aperture forms as a result of muscles pushing against the air which moves through the lips. This may not be perfectly centered horizontally, and due to the one lip being rolled behind the other will most

definitely not be centered vertically. Downstream players tend to prefer a 2/3rds upper lip to 1/3rd lower lip placement, and upstream players tend to prefer the opposite. The best way to find the ideal mouthpiece placement is with a mouthpiece rim so that vibrating the aperture can be observed.

IN SUMMARY: *The embouchure can only be formed when air is moving through the lips. We want to find the best distance between the lips, balance pucker versus smile, and airstream direction which most focus and concentrate the tone. We also want to minimize mouthpiece pressure and use just enough firmness in our corners to prevent the lips and cheeks from puffing (but no more than that).*

Resonance

When the frequency of the vibrating embouchure matches the natural resonant frequency of a brass instrument, a standing wave will form inside the instrument. This phenomenon is known as resonance and is the ultimate goal of sound production. Resonance greatly amplifies and concentrates the sound of the vibrating embouchure. It makes the sound both more efficient to produce as well as more characteristic of our instrument.

In order to achieve maximal resonance on a brass instrument, we must precisely align the pitch of our vibrating embouchure with the middle of the partial. When our lips vibrate too high or low compared to the middle of the partial, we will work harder to achieve the same volume and clarity of tone. It is important to keep the lip vibration matched to the partial on all notes regardless of their length, dynamic, pitch, or musical purpose.

We must also consider that the standing wave we form does not begin on the outside of the lips. It actually beings somewhat inside our mouthpiece, and how far it penetrates into our oral cavity depends on the frequency. Lower pitches penetrate further than higher ones. In order to fully optimize resonance, we use brighter vowels (“eee”) to help facilitate the upper register and darker ones (“uhh”) to to help facilitate the lower register.

IN SUMMARY: *We achieve maximal resonance on a brass instrument by precisely matching the pitch of the lip vibration and vowel formation with the middle of the partial.*

Flexibility

The goal of flexibility on a brass instrument is to most efficiently transition the tone between different pitches and dynamics. We ultimately ask ourselves what changes as we do this. To fully address this we must consider the airstream, embouchure, tongue position, mouthpiece placement, and valve technique.

Airstream

As previously discussed, higher pitches require greater intra-oral pressure with less airflow while lower pitches require precisely the opposite. Louder dynamics require greater intra-oral pressure with more airflow while quieter dynamics also require precisely the opposite. Flexibility on a brass instrument depends in part on our ability to smooth out these transitions with the airstream.

IN SUMMARY: *To play higher, we make the airstream thinner and faster. To play lower, we make the airstream wider and slower. To play louder, we make the airstream wider and faster. To play more quietly, we make the airstream thinner and slower.*

Embouchure

As we play higher or more quietly, the aperture must get smaller. As we play lower or more loudly, the aperture must get larger. However, these transitions must occur in a way that does not disrupt the ability of the embouchure to continue vibrating. In general, the distance between the lips and balance between pucker and smile should mostly remain constant. However, the lips will roll in more to create the smaller aperture and out more to create the larger one. In order to keep them vibrating at the same pitch, the airstream will end up being directed more off center as we play higher and softer and more straight ahead as we play lower and louder.

IN SUMMARY: *To play higher or softer, we roll the lips in and blow off center. To play lower or louder, we roll the lips out and blow more straight ahead. However, we always try to maintain the same distance between the lips and preserve the balance of pucker and smile.*

Tongue Position

As discussed earlier, we need the tongue arch to rise so that it shrinks the volume of the oral cavity as we ascend in pitch (forming more of an "eee" vowel). Consequently, as we descend in pitch we need the tongue arch to open so that it increases the volume of the oral cavity (forming more of an "uhh" vowel). The tongue arch should not respond to changes in volume, only pitch.

IN SUMMARY: *As we play higher, use more of an "eee" vowel. As we play lower, use more of an "uhh" vowel.*

Mouthpiece Placement

Since the airstream direction changes as the embouchure ascends or descends in pitch the mouthpiece placement will also need to change. Ideally, the mouthpiece should not move relative to the lips. Instead, the mouthpiece and lips should move together as a system up and down the teeth while transitioning into different registers. This motion is called a pivot. Ideally we should work to smooth out and minimize this pivoting motion. However, it is impossible to play without pivoting. It is also likely that the mouthpiece will need to move relative to the lips to get the extreme low register to work, although we should work to minimize how much we need to do this as well.

IN SUMMARY: *As we play higher and lower, we need to let the mouthpiece and lips slide together up and down relative to the teeth. Try to avoid repositioning the mouthpiece on the lips as much as possible.*

Valve Technique

Many brass players unfortunately do not put much thought into how they move the valves, but it surprisingly affects many aspects of their playing. First, we want to be able to move the valves quickly and easily. In order to achieve this, it is important to position the hand so that the wrist is flat. This enables the fingers to have the greatest range of motion with the least amount of isometric tension. It is also important to consider the timing between the movement of the valves and the change in pitch of the vibrating embouchure. Ideally we want to synchronize them such that the valve combination for the new note occurs at the exact same time the embouchure gets there.

IN SUMMARY: *Position the valve hand so that the wrist is flat. Always synchronize the movement of the valves with the movement of the vibrating embouchure.*

Articulation

The goal of articulation on a brass instrument is to be able to start, stop, and shape notes easily without sacrificing the tone quality of those notes. To fully address this we must consider the attack, sustain, decay, and release of our notes.

Attack and Sustain

The basic challenge of a note attack is to go from silence to instantaneous sound. While it is possible to achieve this without using the tongue by briefly accelerating and quickly decelerating the airstream (known as a breath attack), this is a very inefficient way to attack notes. A tongued attack generally requires much less effort and almost always produces and clearer more direct attack.

For a tongued attack, the front of the tongue essentially functions as a valve which blocks the airstream. As we blow against this blockage a bit of pressure can build up. When we release the tongue, the air will accelerate into the instrument and instantly start the note. If we build up too much pressure behind the tongue, the air will be going too fast and we will tend to chip the note. If we don't build up enough pressure behind the tongue, the air will be going too slow and we will tend to scoop into the note. Therefore the main challenge of getting a good attack is to build up just the right amount of pressure behind the tongue so that the pitch during the attack of the note is the same as what it will be during the sustain. Obviously this correct amount of pressure behind the tongue will be different in different registers and at different dynamics. Therefore the way we tongue will need to be different in different registers and at different dynamics as well.

Many brass players and teachers put a great deal of emphasis on precisely where the tongue makes contact inside the mouth during note attacks. While this advice is usually well intentioned, it must be mentioned that every individual mouth, tongue, and oral cavity shape is different. Instead of only considering where the tongue makes contact, we should focus our attention on the entire tongue-stroke itself. If the tongue is able to create a reliable seal, move only a very small amount in order to break that seal, and maintain a relatively neutral shape that doesn't require a lot of tension to form then the tongue-stroke is efficient for that individual player. For most people this will mean that the tip of the tongue touches (never press hard) the gum behind the upper front teeth. However, for many people there will need to be significant deviations from this to accommodate the physical dimensions of their mouth. In general, most players will find the most success creating a seal by flattening out the tongue.

While the tongue is mostly responsible for controlling the attack of a note, the airstream also plays a significant role. The act of blowing against the tongue while it blocks the free passage of that air is what creates the attack itself. Once the note is started the airstream will need to continue to keep the note going at the same volume. It is important to practice perfecting this transition from the attack into the sustain of the note. The tongue gets it started, but the air must be there to continue making the note. We also want to ensure that the jaw is not getting involve in the attack. For many people, chewing during an articulation is an unconscious involuntary action that requires practice to avoid doing. Chewing with the jaw will significantly interfere with sound production since it regulates the distance between the lips.

IN SUMMARY: *Always keep the tongue as relaxed as possible and move it as little as necessary to break the seal and attack the note. Focus on building up just the right amount of pressure behind the tongue and blowing through the attack into the sustain of the note to avoid chipping or scooping. Avoid chewing with the jaw during attacks.*

Decay and Release

The main challenge of the decay and release part of a note is to keep the pitch under control without sacrificing the quality of the sound. There is a natural tendency to go flat as we play quieter. Many of us will tend to make adjustments to the embouchure to keep the pitch from dropping, and these adjustments will interfere with our ability to produce a beautiful resonant sound. If we sacrifice sound production enough, we will eventually lose the sound entirely. The key to a great decay and release is to gradually lessen the airflow and let the entire embouchure get smaller without introducing tension anywhere else in the body. Many players will greatly benefit from practicing long tones in different registers with very gradual diminuendi and then working toward the faster diminuendi we use for note decays. Last, we should generally avoid releasing notes by stopping them with the tongue. While this can on rare occasion produce a clean and desirable note release, most of the time it is a bad habit that makes it inefficient to retake the tongue for the attack of the next note.

IN SUMMARY: *Stay relaxed during the decay of the note so the sound quality is not sacrificed and generally avoid releasing notes with the tongue.*