Design Principles
In 1977, The Bruel and Kjær Company of Denmark published a land-mark paper concerning the mechanical stability of high fidelity turntables: The Audible Effects of Mechanical Resonances in Turntables. Using the then new technology of Fast Fourier Transform analysis, Bruel and Kjær analyzed a high end turntable to determine the importance of a turntable's mechanical stability. The conclusion of the B&K research was that a high fidelity tone-arm should have a low effective mass and be mechanically damped to a Q of 0.5 to eliminate the side-band distortion caused by mechanical instability. Side-band distortion is particularly objectionable to human hearing. As a result of this conclusion, many light weight tonearms were developed but the issue of damping was largely or completely ignored. There is a good reason for ignoring this requirement, damping is not simple to implement and requires a new approach to tone-arm design. During my research when designing Amadeus I have concentrated on achieving a very high degree of mechanical stability and have been required to use novel techniques and materials. I am pleased to report that my efforts have resulted in a stable turntable design that is simple in appearance but has a deep foundation of experiments and technology. During my experiments, I have constructed many prototypes, perhaps as many as fifty.

Controlling The Mechanical Resonances Of The Tone-Arm
The Amadeus tone-arm does not have a bearing in the normal sense. Many tone-arm bearings use high quality ball bearings that have clearances in the low micron range. However, that is where all the action takes place. The Amadeus bearing has zero clearance and damping for un-rivaled performance. The tone-arm is constructed with a golf ball partially immersed in high viscosity silicone fluid. Golf balls are very precisely made and are well-suited for this application. The degree of damping is adjustable. A tone-arm without damping will cause the cone of a subwoofer to pump markedly.

Controlling The Resonance Within The Arm Tube
The 10.5 inch arm tube of Amadeus (9" on Simplex) is filled with a special grade of sand to eliminate any resonances within the tube. This technique is very effective and is unique to all Well Tempered designs.

Rotational Stability Of The Spindle
The Amadeus round spindle rotates in a triangle hole of Teflon and the corner of the square is oriented to the motor. This arrangement causes the spindle to rotate in a zero clearance bearing. If the spindle is in the normal round hole, the contact with the bearing surface is made of one point, a condition which can cause rotational instability. With the round spindle rotating in a triangle hole, contact is made at two points resulting in zero clearance and a high degree of stability.

Bearing Noise
The Amadeus bearing uses a Teflon thrust bearing. The stainless steel spindle has a precision point and rests into a small hole in the Teflon thrust bearing to achieve very low noise.

Acrylic Platter
The Amadeus platter is acrylic which I have found to be very suitable for this purpose. In addition to having desirable mechanical properties, this material is relatively heavy resulting in increased moment of inertia for lower flutter and wow.

Drive Belt
During my research, I have measured hundreds of belts of various types, using flutter and wow as the criteria. None have the excellent characteristics of the Amadeus belt. The Amadeus is a polyester filament and has a diameter of 0.004 inches. To use this belt requires a knot and this may normally cause a problem. I have overcome this problem with a motor pulley of a special design to accommodate the knot. In addition to being a superior belt, this material is widely available and easy to replace. I tested the durability of this belt with a test of fifty days continuous operation with no effect.

Motor and Motor Drive
Amadeus uses a small dc motor and is driven by a torque servo of my own design. The motor is mounted to the plinth and is very effectively mechanically decoupled by a ring of isolation material. The combination of belt, motor, motor drive electronics, and isolation results in low flutter and wow.

Plinth
The Amadeus features a dual layer MDF sandwich construction plinth finished in a black lacquer. Also available is the GTA version in a dual layer black anodized aluminum/acrylic sandwich construction both are fitted with squash-ball isolation feet.

William Firebaugh – Designer