I asked the University of Texas at Arlington Physics department to take a look at both the new and old NBA basketballs. I asked them to compare the 2 and let me know what they thought. No preconceived notions. No prejudice. Just science.

Below is their data and response. Before you get to it, i wanted to give my conclusions.

1. Keep the ball. Its not perfect, but it would create more hassles than it solves to change.
2. Check every floor in the NBA for “dead spots” and make sure the floors are consistent. This ball will be more impacted by soft spots on the floor.
3. Rather than waiting to see how moisture impacts play and if it creates turnovers, recognize the properties and advantages of the ball, that it is the same regardless of how old or new, and change out the balls at halftime, at the end of quarters, or when it gets wet. Just like they do in baseball and football.
4. The balls retain dirt. Lots of it. By the end of a game or two, the nets look like there have geen kids throwing dirt at them. We need to find a way to keep the balls clean and let every team know so if a fan touches one after a game they dont get grossed out. Changing the balls can help alleviate this problem.
5. AFter this season, look at the embossing and layout on the ball and see if there is a better option. This will make the new ball bounce “true” when compared to the old ball.

Here is the report and a big THANK YOU to UTA and all the hard work they did. They are a first class program and did a wonderfully thorough job

October 26, 2006: MavBalls Investigation

Executive Summary:

Thus far, over the period October 14-present, through various tests, we have determined four major performance differences between the old leather balls and the new synthetic balls provided to us by the Dallas Mavericks organization. It should be noted that the leather balls provided were not new, but rather had been used for extended periods, whereas the synthetic balls provided were brand new.

(1) The two types of balls have different heights of return bounce when inflated to the same pressures and dropped from identical heights. The new synthetic balls display measurably reduced return height than the leather balls – about 5% less on average, when dropped from about four feet. Our compression measurements also indicate differences in elasticity. The difference in bounce heights may translate to effects on players’ reactions and handling in terms of dribbling, passing, rebounding off the backboard, bouncing off the rim, etc.

(2) The surface of the synthetic balls display a factor of two higher coefficient of static friction when both leather and synthetic balls are dry. This characteristic would make the synthetic balls easier to grip (stickier) than the leather balls, when dry.

(3) However, with a few drops of added moisture on the surface of each type of ball, the new synthetic balls have a coefficient of friction which is at least 30% smaller than similarly moistened leather balls. We have also measured the moisture absorption rate, which confirms that the synthetic ball absorbs moisture at a much slower rate, leaving more of the moisture on the surface. Therefore, when wet, the synthethic balls are much harder to grip and handle (slippery). By contrast, our measurements indicate that the grip of the leather ball improves after similar moistening.

(4) The synthetic balls bounce more erratically (i.e., at a wider range of angles) off floors. Preliminary measurements suggest about 30% greater deviation in the position of the synthetic ball after a bounce. More tests are scheduled to quantify this precisely.

All the above conclusions should be considered preliminary and subject to revision since we are still actively testing.

Details of Measurements:

(1) We have measured the size and weight of the two types of balls – they are essentially identical in these base characteristics (less than 1% difference). The conditioned leather balls and synthetic balls have similar patterns on the surface. However, prior to use/conditioning, the leather balls display a spherical appearance to the “pebbling” — instead of the flatter apperance seen in conditioned leather balls and synthetic balls.

(2) Tests have shown that the synthetic ball bounces back

lower by 5-8% when dropped from a height of little over four feet, depending on the hardness of the floor. Specifically, for a hard linoleum floor with concrete underneath, the leather ball bounced back an average distance of 2.2 inches higher compared to the synthetic ball, when dropped from a height of 4 feet 3.7 inches. The coefficient of restitution is 0.81 for the leather ball at this height, increasing monotonically to 0.85 for successive bounces till they reach approximately one third of the drop height. The coefficient of restitution for the synthetic ball was 0.79-0.84 over the same range of heights. The difference in bounce was more pronounced (increasing to 4 inches) on softer, more pliant floors.

(3) In order to compensate for the difference in bounce, we re-tested the basketballs by overinflating the synthetic balls. The synthetic ball had the same bounce characteristic as a conditioned leather ball when overinflated to 14 psi (the required overinfl
ation depends on the hardness of the floor). The leather ball was inflated to the recommended pressure of 8.5 psi for comparison.

(4) The bounce test was repeated with a new (unconditioned) leather ball. We found that the unconditioned leather ball had similar coefficient of restitution to the synthetic ball at same inflation — that is, both bounced back essentially to the same height. We conclude that the conditioning of leather balls increases their bounce. However, thus far, we have not attempted to condition our new leather ball and repeat the tests.

(5) The synthetic balls absorb water at a much slower rate, averaging 8.6 grams per minute. The conditioned leather balls will absorb water more rapidly, about 70 grams within a minute. After quasi-saturation at these water masses, the leather balls absorb water at a much slower rate than the synthetic balls, averaging 3.3 grams per minute.

(6) We have performed compression tests of all the balls. The data is being analyzed. Qualitatively, we find that the leather balls compress more easily under the same load, compared to the synthetic balls. The compression is linear over reasonable range of forces; we are in the process of quantitatively determining the elasticity.

(7) Initial friction tests show a much higher coefficient of friction for the synthetic ball when dry. The coefficient of friction between the surface of the synthetic ball and a silicon surface (medical literature shows silicon to have a friction coefficient similar to the human palm) is about 3.2, for our experimental setup. The friction coefficient is 1.69 for the leather ball, using the same procedure.

(8) Friction tests with liquids such as Visine (which has viscosity higher than water, similar to human tear drop, possibly closer to sweat) applied to the silicon (one drop per 2″x2″ area) show that the coefficient of friction increases for the leather ball. After repeated application of drops, the coefficient increased gradually by at least 30% for the leather ball, thereby making it more “gripable”. After quasi-saturation. adding drops reduced the coefficient by 20%, relative to a dry ball. However, for the synthetic ball, the coefficient of friction reduces immediately by 55% with the first drop of liquid. A larger reduction is seen with repeated application of liquid. In conclusion, the wet synthetic ball is significantly more slippery compared to wet leather balls.

(9) During our bounce tests, we observed that the synthetic ball bounced more erratically compared to the leather ball. Preliminary data shows an average horizontal deviation (near the apex after the bounce) of 15 mm for the leather ball, and 22 mm for the synthetic ball, after bouncing off the floor. Examination of the surface characteristics of the synthetic ball showed that more than 20% of the surface is embossed with text and logos to a depth of a few millimeters. We speculate that the more uneven surface of the strongly embossed synthetic balls is the principal cause for the erratic bounces in our tests. The surface of the leather ball is far more consistently spherical and even. We are continuing to improve these measurements.

Future tests:

(a) Continuing studies of friction to quantify the loss of

grip when the synthetic ball is wet.

(b) Wind tunnel test of aerodynamic drag is scheduled for

later this week.

(c) Futher quantitative measurement of erratic bounce is scheduled for next week.

(d) Repeat the bounce test (coefficient of restitution) at the American Airlines Center, if possible.

(e) All other tests are being repeated or redone with

increased precision.

Preliminary recommendations:

Based on our measurements so far, we would recommend that the embossing of the synthetic ball should be discontinued, to reduce erratic bounces. The material of the synthetic ball should be made more moisture absorbent, to increase friction and associated “gripability” when the surface is wet. The thickness of the rubber backing could be reduced to increase bounce. These relatively minor changes in manufacturing, it seems to us, would meet the dual needs of a more uniform low maintenance ball desired by the league with the performance characteristics approximating those which the players are accustomed to and prefer.

General comments about our measurements:

All tests were done with the balls inflated at 8 or 8.5 lbs. For comparisons shown above, old and new balls had the same inflation. Every measurement has been or will be repeated multiple times. We will include an estimate of errors in the next report. We used the following sample of balls for our studies: three conditioned leather balls provided by the

Dallas Mavericks, three new synthetic balls provided by the Dallas Mavericks, two new (not conditioned) official NBA leather balls purchased by us, and one new official NBA synthetic ball purchased by us. At this

stage, please note that all measurements should be considered preliminary.

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