

*R. Sinclair*



BOOMERANG ASSOCIATION OF AUSTRALIA

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Here is the November issue of our Newsletter, and it is of course, the last issue for 1971, and on behalf of your committee, I would like to take this opportunity to wish all our readers a very Merry Christmas, and plenty of good throwing in the New Year.

In this issue, you will find a very interesting report on DCA Wind Tunnel Tests conducted on Boomerangs in the second half of 1970, and thank the DCA for making this report available.

Other items of interest are the report on the Darlington Point Championships, and another excellent article in the series on boomerang throwing skills by Jeff Lewry. We ask that you note the meeting dates for 1972 and also the meeting on December the 8th which will be primarily concerned with competition rules. Any members with comments and views on these rules are requested to let the secretary have them in writing before the end of this month.

Incidentally the date for the Moomba 1972 Championship has been fixed, it is March 5th, the venue is the same as last year. The starting time will be earlier than last year, 9 a.m. to be precise. The Albury Championship will also be in March, the date is yet to be fixed, but it looks like the last weekend in the month, and it is hoped we can hold a General Meeting of the B.A.A. after the competitions.

Finally, before I close down and let you get on with the rest of the newsletter, may I make a plea from the Editorial Chair for articles, letters, comments and material for inclusion in our 1972 newsletters. All contributions will be gratefully received.

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SOME NOTES ON THE AERODYNAMIC QUALITIES OF THE AUSTRALIAN  
BOOMERANG

Prepared in the Airworthiness Branch of The Australian Department of Civil Aviation.

The aerodynamics of the boomerang are very similar to those of the helicopter rotor. The combination of linear and rotary velocity leads to an increased velocity of the advancing blade and a reduced velocity over the retreating blade. The force asymmetry which results is removed in the helicopter by allowing the blades to flap, in the boomerang it leads to the typical curved path.

If the boomerang is thrown in a vertical position with its convex surface towards the thrower and given an anti-clockwise rotation, then the upper part of the disc experiences the higher velocities and generates more lift than the lower side. Hence there is a torque  $T_1$  created about the centre of gravity which is anti-clockwise when viewed from behind. The complexity of the flow patterns is compounded when the blades of the boomerang are swept back. Then the wind velocities over the blades are such that more lift is distributed over the forward part of the disc than the aft part. There is now another torque  $T_2$  which is anti-clockwise when viewed from above.

The aerodynamic forces acting on the boomerang are thus the lift normal to the direction of motion, the drag parallel to the direction of motion, the torque  $T_1$  and  $T_2$ , and a further drag torque  $T_D$  which tends to slow down the rate of rotation  $W$ . It can be shown that approximately,

$$\begin{aligned} L &= a w^2 & D &= b w v \\ T_1 &= c w v^2 & T_2 &= d w v \\ T_D &= e w^2 \end{aligned}$$

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If the coefficients of proportionality are evaluated in a wind tunnel and the differential equations of motion are set up, then trajectories would be obtained which could well be indistinguishable from those obtained by flight test.

Some insights into the general behaviour can be gained if certain aspects of the motion are isolated. Thus the spinning boomerang acts like a gyroscope. If a gyroscope with moment of inertia  $I$  spins with rotational velocity  $W$ , and a torque  $T$  is applied perpendicular to the spin axis then the gyroscope precesses around an axis perpendicular to both the spin and torque axes with angular velocity

$$= \frac{T}{IW}$$

From this it will be seen that torque  $T_1$  leads to a movement of the front of the disc to the left at a rate  $\frac{C}{I} \cdot v^2$ , and torque  $T_2$  to a movement of the top of the disc to the right at a rate  $\frac{d}{I} v$ . The end result is that the boomerang curves to the left and its plane of rotation tends to lie down towards the horizontal. Note that the motion is independent of  $W$ , provided it is above a certain minimum value.

Over most of its path the boomerang's orbit is traced out on the surface of a large sphere, the radius of which is fixed for a given boomerang. This radius increases with increase of moment of inertia, and decreases with increase in the amount of lift generated by the blades. Having fixed the characteristic sphere of the boomerang by its shape and mass distribution the only way

to control its path is through the initial conditions at launch, i.e. its speed and angle to the horizontal. Consider first a reference trajectory :-

The boomerang climbs quickly and swings to the left, reaching its highest point as it passes the thrower at some distance to his left. It sinks as it passes behind him and then climbs a little again as it passes over his head and to his right. It finally curves to the left again and sinks, returning to land at his feet.

If the speed at launch is too low it would not climb very high and will hit the ground at some distance behind the thrower.

If the speed is too high it will climb much higher, and instead of landing at his feet will pass over the thrower's head again and will continue in a direction opposite to that of launch, landing some distance behind the thrower.

If the boomerang is launched too close to the vertical then the trajectory will be flat and touchdown will occur to the left and behind the thrower.

If the launching angle is too flat then the boomerang will climb steeply and instead of coming over the thrower's head from behind will pass behind him and land to his right.

Thus to obtain a true return the boomerang must be launched at the correct speed and angle with a rate of rotation above a characteristic minimum value.

1st October, 1970.

CATCHING YOUR BOOMERANG - The third article in the series on the skills of boomerang throwing by - Jeff Lewry.

Catching is an important part of the expertise in Boomerang Throwing. Good clean catching is pretty to watch and adds greatly to the thrower's pleasure and satisfaction. In competitions, catching really separates the "men" from the "boys" when final scores are posted.

A Boomerang thrown properly with plenty of spin, will have slowed its forward travel and increased its spinning speed, by the time it returns to the throwing point; in ideal conditions, forward travel will be nil and the spinning Boomerang looks like a plate with a hole in it. The thrower's objective now, is to put out one hand, palm uppermost, fingers bent as far back as possible, and keep this hand directly under the apparent "hole" in the hovering boomerang as it descends.

Start this procedure perhaps a second before actually taking the catch, then wherever the Boomerang moves, follow it with your outstretched hand. Let the Boomerang come low - at waist high, a catch is more positive than chest high - and catch by quickly slapping the other hand down over the centre of the Boomerang and thus sandwiching it between the palms.

As mentioned in the other articles, you must be able to "nominate" your throw before the Boomerang leaves your hand. You need to have an idea of the approximate flight path so as to anticipate the return, for it is extremely difficult to reach out and catch a Boomerang moving away from you.

With anticipation, you can be in the "right" position so the Boomerang will be coming towards you. Even on a calm day, a completely hovering Boomerang will have a slight drift one way or the other, and it will be found important to be standing on the "right" side for a catch, as catching will be surer than on the "wrong" side.

Try to develop the habit of catching with arms almost outstretched, for this makes it easier for you to follow the Boomerang's flight right into your hands with your eyes, besides, it looks a lot more expert than catching "blind" against your stomach, meanwhile folding up like a pocket-knife to make sure the Boomerang doesn't fall out one side!

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HELP REQUIRED - Seymour Apex and Jaycees are wanting a boomerang demonstration on January 15th 1972. Any volunteers? If you can help out, please contact the Editor....

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CATCHING YOUR BOOMERANG Cont.

Provided the Editor can stand it, the next article will cover some handy hints for competitive throwing, for the field of battle is the place to put theory into practice.

(The editor can take plenty of this sort of stuff, thanks for your efforts to date Jeff, and looking forward to the next article.....Ed.)

1972 QUARTERLY MEETINGS -

These will be held in Melbourne on the following dates :  
February 23, May 24, August 23, and November 24.  
Unless otherwise advised, the location is -

3 Biscayne Avenue,  
SYNDAL

and the starting time is 8 p.m.

NEXT MEETING -

This will be held at 3 Biscayne Avenue, Syndal on December the 8th, commencing at 7 p.m. sharp. The time slot from 7 p.m. to 8.30 p.m. has been set aside for discussion related to the current competition rules and suggested changes.

THIS NEWSLETTER IS PRODUCED BY THE BOOMERANG ASSOCIATION OF AUSTRALIA -

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DARLINGTON POINT - 1971

On November 6th, boomerang and spear throwers converged on Darlington Point in the Riverina for the Annual contests. The day began with light to moderate breezes, with occasional mighty puffs! By lunchtime the skies began to look greasy, and then in the middle of the "World" Boomerang Championship the sky opened up, and the wind really let go; competitors and judges scurried for shelter, the trophies blew off the table, and the big beach umbrella protecting the Administration Table snapped off. However, the conditions improved slightly, and despite a steady rain the Championship continued. Competition was intense, and many of the events were very closely fought, keeping the competitors and spectators on their toes. The highlight of the boomerang championships was of course, the "World" Championship, with its tense and exciting finals battled out by Jeff Lewry, Bluey Williams and Geoff Rawson. Jeff Lewry retained the Championship, with Geoff Rawson becoming the runner up.

The World Spear Throwing Championship was won by Jack Byham for the second year in succession; and Roy Johns retained his Riverina Resident Boomerang Champion title.

The winners of the various competitions are listed below, together with the preliminary and final scores in the "World" Boomerang Championship.

- (1) World Spear Throwing Championship :  
Won by Jack Byham of Cobram, Victoria -  
with a distance of 2'6" from the bulls-eye.
- (2) Long Distance Spear Throwing :  
Won by Maurie Walsh of Bowna, N.S.W.  
with a distance of 231'.
- (3) World Championship Boomerang Throwing :  
Won by Jeff Lewry of Bowna, N.S.W.
- (4) Riverina Resident Boomerang Throwing Championship :  
Won by Roy Johns of Griffiths, N.S.W.
- (5) Highest Number of Consecutive Catches :  
Won by Bob Schroeder of Blackburn, Victoria,  
with a score of 6.
- (6) Smallest Boomerang to fly 75 ft. and Return to the 24 ft. Throwing Circle :  
Won by Jeff Lewry of Bowna, N.S.W.  
with a boomerang measuring 8"5" tip-to-tip.

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DARLINGTON POINT - 1971 Continued.

- (7) Largest Boomerang to Fly 75 ft. and Return to the 24 ft. Throwing Circle :  
 Won by Roy Johns of Griffiths N.S.W.  
 with a 31" Boomerang.
- (8) Distance Boomerang Throwing :  
 Won by Jeff Lewry  
 with a distance of 229'4".
- (9) Highest Score from 5 Throws under Championship Conditions, Right Handers throwing Left Handed Boomerangs, and vice-versa.  
 Won by Bruce Kyle of Sydney, N.S.W.  
 with a score of 49.
- (10) Most Accurate Return :  
 Won by Bruce Kyle of Sydney N.S.W.  
 with a distance of 7'0" from the peg.
- (11) Shortest Time to Take 10 Catches, (the boomerang had to travel 22 yards)  
 Won by Bluey Williams of Burwood Victoria,  
 with a time of 4 mins. 18 secs.

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Now for the individual scores in the "World" Boomerang Championships. (Due to the wet, soggy in fact, saturated condition of the score sheets, the Editor apologises in advance for any transcription errors; if there are any errors please let us know promptly.)

Preliminary Rounds :

Jeff Lewry	12. 8.10.10.10. (50)	9. 8.13. 8.11. (49)	99
G. Rawson	8. 8.10. 8.10. (44)	10. 8. 8. 8.10. (44)	88
I. Williams	0. 8. 8.14.12. (42)	14. 0. 8.12.10. (44)	84
C. Lewry	6. 6.10. 8. 6. (36)	10. 6. 8. 8. 6. (38)	74
Joe Lewry	6.10. 6.12. 0. (34)	10. 6. 8. 6. 6. (36)	70
R. Schroeder	8. 0. 8.14. 8. (38)	0. 8. 8. 0. 8. (24)	62
M. Walsh	0. 8. 9. 8.10. (35)	8. 0. 8.10. 0. (26)	61
L. Janetzki	0.10. 8. 6. 6. (30)	6. 6. 0.10. 6. (28)	58
R. Burns	0. 6. 8. 6. 6. (26)	6. 6. 6. 6. 8. (32)	58
J. Byham	0. 0. 6. 0. 6. (12)	13. 8. 6. 8. 9. (44)	56
B. Kyle	10. 4. 4. 6. 6. (30)	8. 4. 4. 6. 0. (22)	52
A. Janetzki	0. 6. 0.10. 0. (16)	0. 6. 8. 4. 6. (24)	40
H. Robb	2.10.10. 4. 0. (26)	0. 0. 0. 6. 6. (12)	38
B. Knight	0.12. 0. 8. 0. (20)	8. 0. 9. 0. 0. (17)	37
M. Maxwell	9. 0. 0. 0. 0. (9)	0. 0. 4. 4.12. (20)	29

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DARLINGTON POINT 1971 - Continued.

Final Rounds

Jeff Lewry	10.12.12.14. 8. (52)	0.12.10. 8. 0. (30)	82
G. Rawson	6. 8. 8. 0. 8. (30)	14.10.10. 8. 8. (40)	70
I. Williams	0. 0. 6.12. 0. (18)	8.10. 6. 8. 8. (40)	58

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Darlington Point are to be congratulated once again upon their first class organisation, the only thing they were unable to control was the weather!

Contestants and spectators had an exciting and enjoyable day, and look forward to the 1972 competitions.

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BANNOLDSWICK BOOMERANGERS

Pupils at Bannoldswick Secondary Schools, Yorkshire, U.K. have taken up boomerang throwing. Teacher, Mrs. Eleanor Fall said: "There is great enthusiasm by both boys and girls, but there has to be strict discipline because it can be extremely dangerous. The sport is good exercise and keeps you alert."

Star marksman in the class is 14-year-old Nigel Robinson. "He can throw the boomerang about 50 yards and make it return to his feet," said Mrs. Fall. "He can also throw three at once - quite a feat for a boy of his age."

The boomerangs travel at a great speed, - but so far no school windows have been smashed!!!

YARAKILA JEFF IN NEW ZEALAND

Jeff Lewry's trip to New Zealand was a great success, and has helped in promoting the boomerang outside of Australian Territory. Most of you will recall that Jeff's trip was a direct result of his winning the Boomerang Throwing Championship at Darlington Point in November 1970.

After a few scheduling problems Jeff eventually set out in late July, and perhaps the major highlight of the trip was active participation in the Palmerston North Centenary Celebrations. At Palmerston North, Jeff faced a crowd of about 10,000, who had turned out to watch the attempt on the distance record and highest number of catches records, (both held by Jeff.) The organisation was excellent, stewards and judges all on their toes, but unfortunately the wind didn't let Jeff beat his own records. Sad to say, that during practice in the morning, one throw passed the 85½ yard mark, and returned to within a yard of Jeff, but when the official try came, the best Jeff could do was 82 yards.

Later in the day Jeff took part in the parade and almost wrecked his throwing hand signing autographs.

Other activities in Palmerston North included demonstrating boomerang throwing at several schools, and at the "Lions" match where 25,000 packed the ground. It was here that Jeff showed that anyone can put a ball through the posts to convert a try, but it takes an expert to convert a try using a boomerang, and getting it between the posts on the return leg.

Anyway, from Palmerston North, Jeff had the privilege of throwing for the Governor General, who took more than a casual interest in the boomerang. Jeff also did a bit of throwing at high altitudes, and remarks that he seemed to be getting about a 20% increase in range compared with sea-level throwing. At one spot, Jeff entertained a bus load of tourists by throwing right around their bus!

The New Zealand scenery impressed Jeff, and took in snow covered mountains, jet boat trips, boiling mud, geysers and volcanoes. Jeff also commented most favourably on the friendly attitude of the New Zealand people. I only wish we had more space to give you more details of this trip, but if you want to learn more, you'll have to ask Jeff, - he has a lot to tell, and really makes you want to pack up and head off across the Tasman for a holiday.

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