WORLD ATHLETICS

MECHANICAL AIDS REVIEW PANEL

IN THE MATTER OF AN APPLICATION BY BLAKE LEEPER

PANEL MEMBERS

DAVID GRACE QC – CHAIR (AUSTRALIA)
RAUL CHAPADO (SPAIN)
JINARO KIBET (KENYA)
DR CAROLINE NICOL (FRANCE)
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DECISION

World Athletics has satisfied its burden of proof on the balance of probabilities that the use of the mechanical aids by Blake Leeper in the form of passive-elastic carbon-fibre running specific prostheses (RSPs) that give him a leg length of 104 centimetres and a standing height of 184 centimetres provides Blake Leeper with an overall competitive advantage over an athlete not using such aids, with the result that the use by Blake Leeper of such RPSs in any World Athletics sanctioned events is not allowed pursuant to Rule 6.3.4 of the Technical Rules of World Athletics.

DATE OF DECISION

26 April 2021

REASONS FOR DECISION

Introduction

1. Blake Leeper is a bilateral transtibial amputee 400 metre sprinter from the United States of America. He uses passive-elastic carbon-fibre running-specific prosthesis (RSPs) to enable him to engage in running.

2. On 24 December 2020, he submitted an application to World Athletics to be permitted to run on particular RSPs in the same competition as able-bodied athletes in World Athletics sanctioned 400 metre events, including (if selected) the 2021 Tokyo Olympic Games, and any qualification events leading up to the Olympic Games. Subsequent to that application, by arrangements between Mr Leeper and World Athletics, an extensive testing regime was undertaken by Mr Leeper at the Southern Methodist University in Texas, USA, over several weeks in February and March 2021. The testing was conducted and regulated by Professor Weyand who was appointed by World Athletics. Doctors Grabowski and Beck observed the testing on behalf of Mr Leeper.

3. In determining the application, World Athletics is required to consider its Technical Rule 6.3.4. That Rule, as applicable to this application, provides as follows:

> "For the purposes of this Rule, the following examples shall be considered assistance and are therefore not allowed;
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> 6.3.4 The use of any mechanical aid unless on the balance of probabilities the use of an aid would not provide them with an overall competitive advantage over an athlete not using such aid".

4. The Mechanical Aids Review Panel ("the Panel") was established by the World Athletics Council in January 2021. The Panel reports to the Council. The role of the Panel is to consider applications and determine pursuant to Rule 6.3.4 of the Technical Rules, whether any mechanical aids proposed to be used by an athlete provide him or her with a competitive advantage. The Terms of Reference of the Panel include, inter alia, the following:

(a) the Chairperson and the pool of persons who may sit on a Panel shall be appointed by the President and Chief Executive Officer of World Athletics under delegated authority from the Council;

(b) the Panel shall consider applications in a timely and efficient manner and make a decision in respect of the application;

(c) the Panel shall liaise, coordinate with and attain advice from other World Athletics Commissions, Working Groups and Departments, where required, and/or other relevant experts on specific issues concerning an application;

(d) the Panel shall act at all times for the sole purpose of conducting a full and fair assessment of every application submitted and review each application fairly and impartially, and base its decision solely on its assessment of the evidence before it;

(e) the Panel shall issue written decisions with reasons and may publish the decision or a summary of it.

5. On 3 July 2019, Mr Leeper applied to the IAAF (the former name of World Athletics) for a ruling that the RSPs that he then used were allowable under the Rules. On 18 February 2020, the application was denied on the basis that Mr Leeper had not met his burden of proof to show on the balance of probabilities that his use of the RSPs would not provide him with an overall competitive advantage over an athlete not using such prostheses. Mr Leeper appealed to the Court of Arbitration for Sport (CAS).

6. A two day hearing before the CAS by video-link occurred on 13 and 15 July 2020. The decision has been published under the citation CAS/2020/A/6807 Blake Leeper v International Association of Athletics Federations. The decision is dated 23 October 2020. The CAS decided that Technical Rule 6.3.4 (cited

above) was unlawful and invalid insofar as it placed the burden of proof upon an athlete desiring to use a mechanical aid to establish that the use of the mechanical aid will not provide the athlete with an overall competitive advantage over an athlete not using such an aid. However, the CAS found that the IAAF had established on the balance of probabilities that the particular RSPs used by Mr Leeper gave him an overall competitive advantage over an athlete not using such a mechanical aid and accordingly, Mr Leeper was not permitted to use those specific RSPs in the Olympic Games or World Athletics Series competitions. In relation to the Technical Rule itself, as a result of the CAS ruling, World Athletics now bears the onus of proof as outlined above.

7. The CAS Award is lengthy and details the extensive evidence and arguments considered by the CAS. The Panel has read carefully the CAS Award. It contains detailed reasons for its decision. The Panel is entitled, and does, have due regard for those reasons and to the analysis undertaken in respect of a not dissimilar factual and expert opinion substratum. A number of the findings of facts made by the CAS are relevant to this new application by Mr Leeper and reference will be made to them during the course of these Reasons. The Panel has considered carefully all the expert reports and written submissions submitted on behalf of Mr Leeper and on behalf of World Athletics. In these Reasons, however, the Panel will only refer to those parts of the reports and submissions it considers necessary to explain its reasoning. The Panel has based its decision solely on its assessment of the evidence before it.

Background

8. Mr Leeper's career as a competitive sprinter is set out in the CAS decision at paragraphs 122 – 128. It is evident that he has achieved considerable success as an athlete notwithstanding his disability. He is a multiple medallist in World Para-Athletics competitions.

9. Before the CAS, Mr Leeper relied primarily upon the expert evidence from Doctors Grabowski, Taboga, Beck and Herr. Mr Leeper relies upon a

Declaration from Dr. Graboski dated 24 December 2020 and updated reports from Doctors Grabowski, Taboga and Beck in support of this new application. World Athletics, at the CAS hearing, relied upon the expert evidence of Professors Weyand and Bundle and Doctors Tweedy, Connick and Beckman. The same experts (with the exception of Dr. Herr) are now relied upon by each of Mr Leeper and World Athletics in relation to this new application and they have each produced (albeit jointly in all cases) further expert reports. Each of the experts are eminent in their fields of expertise with vast experience.

10. The difference in this new application by Mr Leeper is that he now seeks approval to use RSPs (of the same type) that are set so that his standing height is approximately 184 centimetres which is approximately 5 centimetres less than the standing height of 189.2 centimetres for the RSPs that were the subject of the application ruled upon by the CAS.

11. The question for this Panel to consider is whether World Athletics can establish on the balance of probabilities that the use of the new RSPs by Mr Leeper would provide him with an overall competitive advantage over an athlete not using such aids.

The present application

12. As stated above, the intention of Mr Leeper is to use new RSPs that are set at a shorter height than the RSPs he previously used. The respective RSPs are of the same type, but the new RSPs are set so that they are approximately 5 centimetres lower than the RSPs with which Mr Leeper had previously run.

13. The Maximum Allowable Standing Height (MASH) rule for disabled athletes was established by the International Paralympic Committee and World Para Athletics to prevent a disabled athlete from using a prosthetic limb that results in that athlete being able to compete at a total height which is greater than the maximum possible height that athlete would have been if they had fully intact biological limbs. The rule reflects the fact that amongst able-bodied individuals

there is a general correlation between the length of an individual's lower limbs and the length of other parts of their body. Although the correlation is not exact, it has been held to be sufficiently strong and established to enable scientists to calculate the maximum possible height a person could be based upon the size and dimensions of certain parts of their body. At paragraphs 378 – 385 of the CAS decision, the MASH rule was considered and found to provide "*an objective and reliable indication of Mr Leeper's likely maximum height if he had intact biological legs*". Before the CAS it was not in dispute that if Mr Leeper was required to comply with the MASH rule, then he would not be permitted to run at a height above 174.4 centimetres. The CAS found that since Mr Leeper's RSPs enabled "*him to run at a height which is significantly taller than his MASH, Mr Leeper is indeed running unnaturally tall. In short, he is running at a height which is significantly greater than the height that he would run at if he had intact biological legs*" (at paragraph 385).

14. In the written application filed on his behalf, Mr Leeper submits that:

(i) the MASH standards are racially discriminatory, as they are not based on any body proportion data from Black athletes of African descent;

(ii) published data demonstrates that Black athletes of African descent have longer legs than Caucasian athletes in proportion to their torsos; and

(iii) there is no basis for World Athletics to apply the MASH standards to meet its burden to prove that Mr Leeper has any overall competitive advantage over able-bodied athletes running on his prostheses at this new height.

15. During the CAS hearing, there was considerable analysis of the ambit and meaning of Technical Rule 6.3.4. This Panel is of the opinion that the conclusion reached by the CAS is a proper basis upon which this Panel shall consider this fresh application by Mr Leeper. At paragraph 310, the CAS said:

> *"Having regard to these factors, the Panel concludes that the only logical, principled and workable construction of the Rule is one that, in the case of disabled athletes who use a mechanical aid to overcome a disability, requires the comparison to be undertaken between the athlete's athletic performance when using the mechanical aid and their likely athletic performance had they not had the disability which necessitates the use of that aid. A disabled athlete who uses a mechanical aid which does no more than offset the disadvantage caused by their disability cannot be said to have an 'overall competitive advantage' over a non-disabled athlete who is not using such an aid. In such a case, the mechanical aid does no more than counteract a disadvantage which the able-bodied athlete does not share. Conversely, a disabled athlete who uses a mechanical aid which does not merely offset the disadvantage caused by their disability, but enables the athlete to achieve better overall performances than they would have achieved had they not had that disability, can be said to have an 'overall competitive advantage'."*

16. The CAS went on to determine that the question about whether a particular disabled athlete derives an "*overall competitive advantage*" can only be answered by comparing the actual performance by the athlete while running with their disability and their mechanical aid and the performance they would hypothetically have been capable of achieving if they were running without that disability and without that aid.

17. In the opinion of the Panel, the comparative analysis undertaken by the CAS at paragraphs 363 – 390 is the same type of analysis that this Panel has to undertake, based upon the new reports that have been provided, the new evidence in the form of the tests conducted upon Mr Leeper in running trials held in Texas in February and March 2021 and our own consideration of all the documentary materials with which we have been provided.

Analysis

18. The primary focus of the submissions made on behalf of Mr Leeper concerns the applicability of the MASH standards to him. The contention that the MASH standards are racially discriminatory as they are not based on any body of proportional data from Black athletes of African descent is not a matter that can be determined by this Panel. As outlined above, our Terms of Reference dictate that our only role is to consider whether or not World Athletics has met its burden imposed by Rule 6.3.4. The contention that the published data demonstrates that Black athletes of African descent have longer legs than Caucasian athletes

in proportion to their torsos is a particular of the argument made by Mr Leeper that there is no basis for World Athletics to apply the MASH standards to meet its burden to prove that Mr Leeper has any overall competitive advantage.

19. In order to determine the ultimate question as to whether World Athletics has met its burden of establishing an "*overall competitive advantage*" there are a number of intermediate questions that need to be answered:

(a) does the MASH rule have an application outside the context of regulating para-athletics?
(b) does the MASH rule have any application to Black athletes?
(c) does Mr Leeper run unnaturally tall in using his new RSPs which give him a standing height of 184 centimetres?
(d) does the height of Mr Leeper's RSPs result in Mr Leeper running faster in the 400 metre event than would otherwise be the case?

20. The Panel has adopted the above questions as part of a stepped and logical process to determine the ultimate question.

Does the MASH Rule have an application outside the context of regulating para-athletics?

21. The Panel has read carefully the Reasons for Decision of the CAS in relation to this question. Mr Leeper effectively maintains that the MASH rule does not apply to him because:

(a) it has no application outside the context of regulating para-athletics;

(b) able-bodied athletes are not subject to any height limits and the fact that the height that Mr Leeper would run at on his new prostheses is very comparable to the standing height of other elite able-bodied 400 metre runners of African descent means that the new prostheses would not result in him enjoying an unfair height advantage when competing against such athletes.

22. It is true that the MASH rule does not govern eligibility to compete in World Athletics sanctioned events. For able-bodied athletes eligibility is not determined by height, strength, leg speed or similar personal attributes or characteristics. However, we adopt the same reasoning process as adopted by the CAS (at paragraph 381) to the effect that the MASH rule is not irrelevant to our assessment and it provides an objective and reliable indication of Mr Leeper's likely maximum height if he had intact biological legs.

23. In its decision (at paragraph 383) the CAS said the following:

> *"An able- bodied athlete cannot, of course, change the length or proportions of their legs. In contrast, an athlete with one or two missing biological limbs can determine the length and proportions of the prosthetic ... limb which they use in place of the missing biological limb. Amputee athletes are therefore able to determine the height at which they compete in a way that non- amputee athletes are not."*

24. The reason for such a rule in respect of amputee athletes competing in para athletic events is clear. It is to prevent disabled athletes from over- compensating for the absence of a missing limb. Issues of fairness obviously are paramount. In respect of the application of Rule 6.3.4 issues of fairness are at the root of the reason for the imposition of the rule.

25. The panel is therefore of the opinion that the MASH rule does have an application outside the context of regulating para- athletics.

Does the MASH rule have any application to black athletes?

26. This is an issue of great contention between the respective experts.

27. In the application of Mr Leeper dated 24 December 2020, a Declaration of Dr. Alena Grabowski was attached. The declaration reviewed existing and historical studies on body proportionality regarding black persons from Africa or of African descent. Dr. Grabowski asserted, based upon those studies, that applying the MASH rule to Mr Leeper was scientifically invalid and racially discriminatory "*as the data underlying the MASH rule are severely limited because they are not*

based on any data from Black persons from Africa or of African descent" (at paragraph 4).

28. Dr. Grabowski relied upon the study by Connick et al in 2015 and quoted from that paper a statement to the effect that it was not known if the equations employed were predictive of the stature in other populations not studied (eg. Black persons from Africa or of African descent). The MASH formula predicts the height double-amputees would be if their legs were intact based on an equation that uses the lengths of their thigh, upper arm, forearm and sitting height and the giving of different ratings to each of those measurements, and then adding an error factor of 1.91 centimetres to cover normal variation. The original study was undertaken by Canda in 2009 but relied upon measurements from Caucasian athletes only. In Connick's study he showed that the formula was equally accurate for Japanese subjects despite them having different body proportions to Caucasians.

29. In 1964, Tanner published a study describing the physique of a considerable number of track and field athletes who competed at the 1958 British Empire and Commonwealth Games and at the 1960 Olympic Games in Rome. That study showed that on average black people have different body proportions to white people. On average they have longer legs, shorter trunks (and therefore shorter sitting heights) and longer arms.

30. Dr. Grabowski emphasised in her Declaration that the Canda and Connick studies wholly ignored in their study populations black persons from Africa or from African descent. She also relied upon the statement by Connick that the MASH regulations would be strengthened with an internationally representative sample. Dr. Grabowski referred in some detail to Tanner's study. She emphasised that the differences in the various measurements between white and black athletes were marked. The development of the MASH formula relied upon the various ratios that he employed and were different depending upon whether the athlete was white or black, according to Dr. Grabowski.

31. In their joint expert report filed on 16 March 2021, Professors Weyand and Bundle agreed that Tanner and others "*have shown that on average black people have different body proportions to white people: on average, they have longer legs, shorter trunks (and therefore shorter sitting heights), and longer arms*" (see paragraph 5.2). They add however that "*these comparisons do not address the critical issue here, because the formula is based on a combination of those measurements, each weighted between 99.8% and 82% of their original length. As a result, the fact that the legs are longer is offset by the fact that the trunk is shorter, and by the different weightings given to each measurement. To answer the question directly, we took the underlying data collected by Tanner…and fed the data into the Canda model. We found that the model predicts standing height just as accurately for black people as it does for white people. In fact, it very slightly over-estimates the standing height of black people. Because the Tanner data relates to Olympic athletes spanning in height from 5 foot to well over 6 foot, this analysis provides strong and robust evidence that the height that the MASH formula predicts for Mr Leeper (174 centimetres) is valid. These data indicate that Mr Leeper's pre-2021 RSPs meant his legs were 15cm longer than they would be if they were intact, and his current RSPs which are 5 centimetres shorter make his legs 10cm longer than they would be if they were intact".*

32. In an expert report of Doctors Grabowski, Beck and Taboga filed in response to that report of Professors Weyand and Bundle, and dated 26 March 2021, the experts criticise the Weyand/Bundle report. They claim that the application of the MASH formula to black athletes of African descent is deeply flawed. Reliance for this conclusion was based upon the absence of any study conducted on the validity of the MASH criteria using athletes of African heritage and the absence of any MASH data collected from black athletes. Criticism was made upon the use by Professors Weyand/Bundle of photos from the Tanner study which were over 60 years old, together with the fact that the Tanner photos were 2D and humans are 3D which makes the measurements inherently incorrect because they were not taken along the axis of the limb segment. The result was that the body segment dimensions reported in the Weyand/Bundle report are not measured but estimated based on multiple inaccurate 2D measurements, it was claimed.

There were a number of other criticisms made of the Weyand/Bundle report, a number of which will be discussed later in these Reasons.

33. In their expert report dated 16 March 2021, Doctors Tweedy, Connick and Beckman, all of the University of Queensland, Australia (UQ report), outline the history of the development of the MASH rule. They state, at paragraph 28:

> *"however, because Canda's equations were derived from a Spanish population, it was not known if the equations work with people from different geographic locations, or whether the equations provided a more accurate estimate of standing height than the upper body method or the Contini method [being the use of an average of the standing height estimations from the ratios obtained by the comparison of limb and other body lengths]. Therefore we conducted a study, published in 2015 (Connick)), that compared the validity of the upper body method, the Contini ratios, and the Canda equations for estimating standing height. We deliberately drew samples from two locations that were geographically distant from Spain – Japan, which is approximately 10,600 km from Spain, and Australia which is 15,700 km from Spain".*

34. The justification, in part, for choosing samples from locations that were so geographically distant from where Canda's sample was taken was that the amount of genetic variability was relatively large. As a result of the Connick study the International Paralympic Committee and World Para Athletics changed the MASH rule in 2018 and based it on the Canda equations. In their report UQ sets out the new MASH rule including the relevant body segment measurements and the formula that should be applied to establish MASH for a male athlete with the disability of a below-knee limb deficiency, as is the case with Mr Leeper. The authors conclude that based upon the quality and size of Dr. Canda's original study and the authors' own study, that they were confident that the current formula used in the MASH rule would not lead to *"significantly different results in different populations, and in particular, in a black population"* (paragraph 33).

35. As to the claim that the use and application of the equations in the MASH rule are without scientific basis, the authors claim that the scientific basis "*underpinning the validity of the formula in different populations is very sound"* (at paragraph 33.5).

36. As a result of the comments made in the expert reports of Doctors Grabowski, Beck and Taboga dated 26 March 2021, Professors Weyand and Bundle prepared an expert report in response, dated 5 April 2021, as did UQ in a separate report dated 5 April 2021.

37. In the Weyand/Bundle response Report, the experts state that the data from the Tanner report provided an opportunity to use published data to evaluate whether the MASH formula can appropriately be applied to male black athletes. They state (at Section B, page 1) that:

> *"Dr. Grabowski's Declaration included with Mr Leeper's application relies heavily on the Tanner data as evidence of different body proportions, specifically longer limb segments and shorter sitting heights in black compared to white athletes of the same stature…With the acceptance of this published data therefore established, we use the Tanner source to evaluate the MASH formula."*

38. In relation to the criticism in the Grabowski Response Report dated 26 March 2021 of the use of 2D images, they respond that the process of extracting accurate length measures from photographs has been common practise in numerous scientific disciplines for over a century. A number of published scientific articles support the application of such techniques which are applied today. Further, in the Grabowski response Report itself a version of this approach occurred. For the reasons stated, including the fact that scientific protocols were followed in relation to collection and analysis, Professors Weyand and Bundle maintain that the analysis of the photographic plates from 1960 taken by Tanner is just as valid as if they had obtained similar photographs from Olympians in 2021.

39. The Professors accepted that measuring anatomical segments from photographs is not as precise as physically measuring the subjects in person, however the MASH estimates using the photographic analysis when applied to the 100 Olympians from the Tanner study had an accuracy of 2.8 centimetres that was close to the accuracy of the gold standard of 2.5 centimetres suggested by Connick in his study in 2015. Importantly the analysis of the Tanner photographs

indicated that *"the MASH predictions for black and Asian athletes have similar levels of accuracy to the whole, and are not systematically over - or under-estimated , as would be the case if MASH was inappropriate for a particular racial group*" (page 2). They maintain that "*because the Canda method uses a more thorough measure of the body's limb segments to achieve accuracy, MASH appears to work equally well for different racial groups*" (page 3).

40. In their response Report dated 5 April 2021, the UQ experts claim (at paragraph 13) that there is absolutely no evidence that the MASH formula is not valid:

> *"While it is true that black people may have shorter trunks and longer limbs than white people, it does not follow that the formula will not be valid because...The Canda formula uses direct measures of four body segments to predict height. This means that if any person- black or white- has a relatively shorter trunk and longer limbs, any disadvantage resulting from a shorter trunk will be offset by relatively longer measures for his upper arm, his forearm and his thigh ... the magnitude of the differences that have been reported are so small they underscore the consistency and homogeneity between racial groups rather than amplifying them ... The difference [between black and white people] in sitting height is 1 cm… and the difference in leg length is 3.2 cm... Mr Leeper is seeking permission to use prosthetics that are 10.98 cm longer than predicted - more than five times the size of the difference between black athletes and white athletes reported by Tanner ... The marginal differences that may or may not exist between black and white populations after application of the Canda formula would be mitigated by the 1.91 cm pure error addition in the MASH formula , which is added to the predicted height of each athlete to account for any possible natural biological variation".*

41. The UQ experts further rely upon findings of the American Association for Physical Anthropology, the world's leading professional organisation for physical anthropologists. Amongst the findings were that natural biological variation between individual human beings, including the proportionality of body segment lengths, is driven by variations in genetic makeup and that race does not provide an accurate representation of human biological variation. Differences and variations exist with and among populations throughout the world but those variations do not align with socially defined racial groups such as whites and blacks.

42. The UQ experts maintain that the Canda equations provided the most valid estimations of standing height across the Japanese and Australian samples the subject of their rigorous study. They found that the error of the estimated stature in the Australian sample was not significantly different from that in the Japanese

sample despite the fact that the Japanese males had significantly shorter thigh length compared to the Australian males and were significantly shorter in standing height:

> *"That the two populations were distinct was particularly important to demonstrate that the equations could be used to generalise across populations, including people with a wide range of body proportions" (paragraph 14.4).*

43. The UQ experts respond further to other criticisms made in the Grabowski report including the claim that there is considerable measurement error in the Mash equation by the under- predicting of heights. This is refuted in paragraphs 15 and 16 of the UQ response report by the citation of figures that appear to reveal flawed analysis in the Grabowski report. The UQ experts go so far as to say that there is more likelihood that Mr Leeper would be advantaged by the MASH rule than the likelihood that he would be disadvantaged. In summary the UQ experts endorse the conclusions of Professors Weyand and Bundle that the MASH formula is a valid means of predicting height for a black population generally and for Mr Leeper specifically.

44. This Panel concludes that the weight of rational scientific opinion is to the effect that the MASH rule does have application to black athletes. We so conclude based upon the rationale expressed in the various reports to which reference has been made. We have carefully considered all the competing arguments and are confident that there is a scientifically proved basis upon which the MASH rule has the asserted application.

Does Mr Leeper run unnaturally tall in using his new RSPs which give him a standing height of 184 centimetres?

45. In her Declaration dated 24 December 2020 Dr Grabowski expressed the opinion that it was *"scientifically unsound to state that Mr Leeper runs at an 'unnaturally tall' height based on the MASH rules, as the MASH rules upon which that conclusion is based do not take into account the limb proportions specific to Black persons from Africa or of African descent ".* That statement is consistent

with the submissions made on behalf of Mr Leeper as presented to this panel. There was no real challenge to the proposition that if MASH applied the correct MASH was 174.4 centimetres.

46. At the CAS hearing it was not in dispute that, were Mr Leeper required to comply with the MASH rule, he would not be permitted to run at a height greater than 174.4 centimetres. At the tests conducted at the Southern Methodist University in February and March 2021 Mr Leeper's standing height with his new RSPs was measured at 184 centimetres with a leg length of 104 centimetres.

47. The difference between the MASH and his standing height is thus 9.6 centimetres. The only conclusion that is open is that Mr Leeper is running unnaturally tall in using his new RSPs.

Does the height of Mr Leeper's RSPs result in Mr Leeper running faster in the 400 metre event than would otherwise be the case?

48. In the joint expert report of Doctors Grabowski , Beck and Taboga dated 26 March 2021, extensive criticisms were made of the testing of Mr Leeper with his new RSPs by Professors Weyand and Bundle at the Southern Methodist University in February and March 2021. The criticisms were based upon what was alleged to have been scientifically unsound and deeply flawed testing procedures. At the heart of the criticisms was the allegation that Professor Weyand's conduct and conclusions were a product of self interest in protecting the credibility of his prior testimony before the CAS and contrary to his publicised scientific theory on prosthesis length. It was alleged that the testing was revised in the middle of the test regime and terminated early at times so as to prejudice Mr Leeper. It was further claimed that the data collected contradicted Professor Weyand's claim that Mr Leeper ran slower with his shorter prostheses and that active steps were taken to prevent Mr Leeper from recording valid performances. Most alarmingly, it was asserted (at page 6) that Professor Weyand repeatedly revised the testing throughout the protocol and that "*is an archetypal example of a test that has a potential for 'rigging' in search of a predetermined outcome".*

These claims were extraordinary. They amounted to allegations of professional misconduct.

49. The claims were entirely and effectively refuted by Professors Weyand and Bundle. Detailed explanations in response to the allegations were made in the response Report dated 5 April 2021. Explanations for what were said to be defects in the testing procedures were discussed in detail. Far from revealing that there was any basis for the claims made against them, Professors Weyand and Bundle in their response present an overwhelming case to the contrary. Most, if not all, of the allegations probably would not have been made if Doctors Grabowski, Beck and Taboga had contacted Professors Weyand and Bundle before written reports were completed and any concerns discussed. Moreover, as Doctors Grabowski and Beck were present, they were in a position to convey any concerns after the testing for a particular day had ended even if they were not permitted to comment during the testing (as was the case pursuant to the testing protocol), but they failed to do so.

50. The essence of the opinion in respect of this question, in the joint Grabowski report dated 26 March 2021, is that there is no support for the conclusion that running taller enables Mr Leeper to run the 400 metres faster than would otherwise be the case. Before the CAS and before this panel Mr Leeper relies upon a paper published by the same experts in 2020 titled *"Prosthetic shape, but not stiffness or height, affects the maximum speed of sprinters with bilateral transtibial amputations"* (the Taboga paper).

51. The CAS found that the paper does not provide reliable support for the proposition advanced by Mr Leeper. The principal reasons for that conclusion (which has been reached also by this Panel), is that the paper was based on data from a sample size of just five athletes and statistically meaningful conclusions from a sample population as small as that are difficult to draw. Further there was no statistically significant relationship between the length of the RSPs of the athletes and their running speeds and each of the participants underwent a significant number of maximal speed tests in a period of just 10 - 11

days which had the effect of undermining the results due to insufficient rest time. This led the CAS to the conclusion that the reliability of the data generated by the study is therefore open to question. This Panel has reached the same conclusion. Still further, the study involved changing not just the height of the RSPs but also changing the model and stiffness of them. Therefore it would be necessary to reliably exclude any possible effects which arise from these different models and different levels of stiffness to draw any reliable conclusions. Importantly some of the results detailed in the paper were in fact consistent with the proposition that increases in prosthetic height causes increases in running speed. The results did not all point in the one direction. The CAS accepted the observation of the UQ experts to the effect that upon the maximum speed attained by each of the five subjects while using their usual model of RSP's at the usual stiffness, all but one of the five subjects achieved their maximum velocity at either +2 centimetres or +4 centimetres, suggesting that increasing prosthetic height may cause an increase in maximum speed (see paragraph 387). A further reason given by the CAS for not relying on the paper was that a number of scientists had written to the Journal that had published the paper asking for it to be retracted due to what the scientists had regarded as a fundamental flaws in the paper's methodology and analysis. This followed the rejection for publication of the paper by a number of journals. This led the CAS to have further concerns regarding the reliability of the conclusions in the paper. This Panel finds the UQ Response Report dated 5 April 2021 to be persuasive in relation to the conclusions regarding the flaws in the Taboga paper.

52. In the Grabowski report, the authors rely upon the Taboga paper as providing a sound basis for the conclusion that there is no relationship between prosthetic height and maximum running velocity. Indeed based upon the results of tests on two athletes taller prosthetic heights of up to 16 centimetres reduced maximum velocity. After conducting the experiments that formed the basis of the Taboga report, the analysis revealed no association between prosthetic height and running speed. If this is indeed the opinion of the experts a question could be asked as to why there is an insistence upon the use of the current RSPs when

height is not a factor? Such an approach would have obviated the need for this application before this panel.

53. The expert reports of Professors Weyand/Bundle and those of the UQ experts are to the contrary. They all conclude that there is a direct relationship between leg length and maximum sprint running speed. The reason for this is their opinion that there is a close correlation between an athlete's leg length and their ground contact length and increasing the size of a prosthetic limb beyond normal anatomical proportions increases ground contact length. Foot-ground contact times are closely linked to sprint running performance due to mechanical and biological reasons. As stated in the Weyand/Bundle report dated 16 March 2021 (at page 6):

> *"The data available on male runners, including Mr Leeper, indicate that top speed contact lengths are roughly equal to the length of the leg. Thus, a simple lengthening of the RSPs results in a direct increase in the length of contact during running. And lengthening the distance travelled within the same foot- ground contact time augments the top speed..."*

54. In the tests conducted at the Southern Methodist University in February and March 2021, Mr Leeper's maximum speed obtained was 10.9 m/s in accordance with the tests conducted. This is disputed by the Grabowski report which claims that a speed of 11.1 m/s was reached. The Panel accepts the Weyand/Bundle response that 10.9 m/s is the validated top speed and the explanation for it. Regardless, the top speed using 5 centimetre taller prostheses in tests conducted in Colorado in 2018 was 11.4 m/s. In their first report dated 16 March 2021, the Professors conclude that this was the expected reduction in top speed due to the reduction in RSP length. It would be further anticipated that the top speed able to be achieved on MASH-compliant prosthetics would be 9.9 m/s. In the 2018 Colorado tests Mr Leeper used RSPs that gave him a leg length of 109 centimetres. The maximum speed reached of 11.4 m/s was extrapolated to provide a 6.8 second performance benefit in the 400 metres. By reducing the length of his RSPs by 5 centimetres, he reduced his leg length to 104 centimetres, and reduced his maximum speed to 10.9 m/s which equates to an increase of approximately 2.1 seconds over 400 metres. This is still much faster

than he would achieve if he was MASH compliant. His current benefit is 4.7 seconds over 400 metres.

55. In the UQ report the experts conduct a detailed analysis that results in the conclusion that longer RSPs permit faster maximum running speeds. Detailed comparisons which were reflected in various tables and diagrams together with detailed descriptions and analyses of the results revealed in these tables and diagrams have satisfied the Panel that there is a direct relationship between leg length and running speed and that therefore the height of Mr Leeper's RSPs result in him running faster in the 400 metre event than would otherwise be the case. This was also the conclusion reached by the CAS.

Do the RSPs intended to be used by Blake Leeper provide him with an overall competitive advantage over an athlete not using such aids?

56. The Panel is conscious of the fact that an athlete using RSPs suffers disadvantages in acceleration out of the starting blocks and in the first part of any 400 metre race and may also suffer a small disadvantage in bend running, although this last point was the subject of disagreement amongst the respective experts. What is clear, however, is that once the acceleration phase is complete and the athlete is able to run freely, the speed able to be achieved is substantial. A viewing of the video of Mr Leeper's race in Prague, Czech Republic, in 2018 when he achieved his personal best time (freely available on the internet) reveals how Mr Leeper actually runs in competition. He deserves full credit for the obvious fitness and expertise shown. Undoubtedly, he has been engaged for many years in extensive training.

57. In any comparison between his performances and that of able-bodied athletes, some further considerations, not considered in any or great detail in the present reports by the experts, are worthy of mention in our opinion. Firstly, the effect of fatigue. It appears that Mr Leeper negatively splits 400 metre races. This means his second 200 metres is faster than his first. This is exactly the reverse of what happens to world class able- bodied 400 metre runners including the world

record holder (and by a sizeable margin). The CAS did hear evidence of this. Secondly, the effect of flexion in the prostheses. Does greater flexion promote increased performance or does it do the reverse? Thirdly, in any comparison of standing height should allowance be made for the fact that an able-bodied athlete is permitted to wear a running shoe in 400 metre events that have a 2 cm thick sole thus giving that athlete a 2 cm height increase? If this is a valid consideration, then the difference between Mr Leeper's current standing height of 184 cm and his MASH may be reduced for comparison purposes with able-bodied athletes. But even so, the increase in height over the MASH is still significant in Mr Leeper's case.

58. Whatever may be the answer to the above questions we are satisfied that on all the evidence presented to this Panel, the present RSPs used by Mr Leeper do provide him with an overall competitive advantage and that therefore he is not permitted to use the current RSPs as mechanical aids in any World Athletics sanctioned events as such use is in contravention of Technical Rule 6.3.4.

Dated this 26th day of April 2021

David Grace QC
Chair, World Athletics Mechanical Aids Review Panel

RAUL CHAPADO (Panel Member)
JINARO KIBET (Panel Member)
DR CAROLINE NICOL (Panel Member)
ANNA RICCARDI (Panel Member)