Introduction
The BMF is not qualified to answer many of the questions posed by the enquiry but as our members have serious concerns with respect to the use of autonomous vehicles we venture to put these before you. Our principal concerns centre around road safety, especially the road safety of motorcyclists.

Q2: User benefits and disadvantages
There could undoubtedly be considerable benefits resulting from the use of autonomous vehicles. The on-road behaviour of a computer-driven vehicle should be rather more predictable than that of human drivers; human error is a factor in most road accidents and taking it out of the equation should have major safety benefits. Systems able to prevent cars from turning into the path of other vehicles will certainly be welcomed by motorcyclists.

However, the above will only be true if the systems on autonomous vehicles are developed to behave correctly at all times. Such vehicles will need to be equipped with sensors capable of correctly detecting all other road users besides the environment itself, and the software must be built to use the information as well as possible. Above all the systems must be tested so that it can be proved that a vehicle will perform as it should. This is a major issue for us when it has recently been shown that some existing systems perform poorly with respect to motorcycles. A motorcyclist in Norway was seriously injured when a Tesla with in "autopilot" mode hit the bike hard from behind.\(^1\) I also draw your attention to a paper presented recently at the IFZ conference\(^2\) which shows that the Forward Collision Warning systems currently available are not reliable, especially with respect to detecting stationary motorcycles; while this is only a preliminary study it is, I think, sufficiently rigorous to raise serious concerns.

It seems plain to us that vehicles with increasing levels of automation must be subjected to extensive testing before they are allowed on public roads. The current requirements for Type Approval and NCAP testing must be expanded to take into account the functionality of all the systems on the vehicle - it must not be left to the manufacturers. An additional consideration here is that we do not think it acceptable to have wide variation in the behaviour of systems, dependent on the manufacturer. This could be dangerous both for drivers switching from one car to another and for all other road users, if they are not sure how a highly automated vehicle will behave.

It is also apparent, if only anecdotally, that drivers of highly automated vehicles will be less likely to be paying full attention to the road - it's probably why they got the vehicle in the first place.

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\(^2\) Preliminary Study of the Response of Forward Collision Warning Systems to Motorcycles, John F Lenkeit, Terrance Smith, Dynamic Research Inc. USA (Not currently available on the internet - I can supply a soft copy if desired).
first place. And therefore it is even more essential that the car itself must be programmed to behave correctly.

In summary, the answer to Q2, at least with respect to road safety, is that autonomous vehicles could be a very good thing but only if the systems can be proven to work in formal and thorough testing. Allowing their use on the road without proper testing is not acceptable.

**Q4 - public attitudes**
While the motorcycling community welcomes the idea of cars that won't turn out of sideroads in front of them riders do have concern that there is currently no rigorous testing scheme in place. Nor will riders accept autonomous vehicles if it means that other vehicle users suffer restrictions on their use of the roads.

**Q7 - is the government doing enough?**
What the government should do more of is put effort into ensuring that extensive and rigorous test regimes are in place for highly automated and autonomous vehicles. This will not be easy, especially with respect to software. Manufacturers will not wish to submit their software for code inspection but recent events (i.e. VW diesel testing) demonstrate they should not be trusted.

**Q10 - changes to infrastructure**
Infrastructure may require changes to cater for autonomous vehicles, though on the road this may be as simple as ensuring that lane markings are always clear. Co-operative ITS systems are expected to require digital and physical infrastructure development for applications such as management of congestion, Green Light Optimisation System Advisory, emergency vehicle prioritisation.

**Q14 - ethical issues**
Ethical issues have received little attention so far. If truly autonomous vehicles are to be realised then there must be clear guidelines as to the expected behaviour of systems. If an autonomous vehicle has a choice between crashing into an HGV, possibly killing the owner, and mowing down a bus-queue of schoolchildren then its priority should not be the protection of the owner. Perhaps with sufficient market penetration such situations need not occur but is that achievable?

**Q18 - effects of leaving the EU**
In the runup to Brexit UK institutions are finding that they cannot take the lead in EU funded projects, though so far this is not preventing them from participating altogether. Certainly a lack of co-operative work with the EU would be detrimental to UK efforts in this field.

*24 October 2016*