CHAPTER 8: CONCLUSION

From this experimental and theoretical study, it is concluded that:

- There is a constitutional/morphological dependence of the ballistic performance of martensitic armour steels;
- A high hardness or strength are not accurate indicators for good ballistic performance;
- The lack of correlation between high strength and high ballistic performance may be explained in terms of the effect of retained austenite on the YS/UTS, which determines the resistance to localised yielding;
- The Ballistic Parameter BP which takes into account the volume fraction of retained austenite RA and the thickness of the armour plate, gives a better prediction of the ballistic performance;
- The combination of twinned martensite and nodular retained austenite appears to be favourable to a good ballistic impact resistance;
- Reaustenitisation of the twinned plate martensite in the centre of the impact region absorbs a significant part of the kinetic energy of the fired round;
- Twinned plate interfaces act as barriers for dislocation movement upon ballistic impact. This produces a high hardness in zone 3 of the ballistic affected region;
- Lath martensite with films of RA have poor ballistic resistance;
- Coarse carbides and needlelike manganese sulphide are also detrimental;
- The impact loading induces transient vibration within the steel plates. The mechanical design of the structure should optimise their size to avoid resonance with the frequency of the firing rifle.

Further work

It was observed in this study that the nodular retained austenite in plate interfaces or on grain boundaries is more susceptible to strain induced transformation than RA with a film morphology in lath interfaces. The stabilisation of the austenite upon quenching of the armour steels and the reason why the retained austenite is nodular or film shaped were not analysed in this study. Further investigation on the conditions of formation, the location and the morphology of the retained austenite in the martensitic steel armour plates will be necessary for further improvement of the ballistic performance and reduction of the plate thickness by exploiting the TRIP effect in these steels.
Analyse the following:
Effect of increased Mo, C and Si
Effect of Cobalt
Ballistic limit in terms of %RA and thickness of the plates