

## Kokkuvõte

Bakalaureusetöös püstitatud eesmärgid said täidetud: turu-uuring ja probleemide kaardistamine, relva mõõdistamine ja mudeldamine, tehniliste sõlmede välja mõtlemine, relvakasti projekteerimine ja tugevusarvutused, relvakastide riikli projekteerimine, dokumenteerimine ja jooniste vormistamine.

Töö jaotati kuueks osaks:

- Kõigepealt kaardistati hetkel kasutuses olevad lahendused ning analüüsiti neid. Esimeste tulemuste järel saadi kinnitust, et hetkel ei ole kõige paremad kastid ja süsteemid relvade transpordi ja väljastuse jaoks loodud. Kuna kogu töö on seotud väga tugevalt konkreetse relvaga, siis mõõdistati relv R-20 ning mudeldati see. Kui kunagi sooviks päriselt sellise kastiga edasi minna, siis tuleks kindlasti relv sisse skaneerida ja kasutada tekkinud mudelit, sest töö jaoks mõõdistamine ei olnud nii täpne, kui oleks võinud olla. Järgnevalt kirjutati lahti, milline peaks uus kast olema ning koostati plokk loogika süsteem kirjeldamiseks, kuidas peab toimima relvade väljastus.
- Et mõista, mis probleeme ka teised kastide kasutajad näevad, siis tehti turu-uuring, enamasti saadi kinnitust samadele probleemidele, mida autor nägi, kuid lisandus ka paar uut. Vältimaks olemasolevate lahenduste loomist, siis tehti ka konkurentide analüüsi sarnastele toodetele.
- Kui kogu eeltöö oli tehtud, siis otsiti alternatiive ning analüüsiti, et leida nende seast parimad lahendused.
- Järgnevalt alustati projekteerimisega, kuid takerduti üsna kiiresti materjali valiku taha. Pärast konsulteerimist õppejõud Mart Saarnaga saadi paika, kus ja mis materjale tasub kasutada.
- Projekteerimise faas oli pikk ja mahukas, kuid lõpuks said kõik vajalikud sõlmed projekteeritud ja üle kontrollitud ning lõpuks ka joonisteks vormistatud.
- Kui kõik oli valmis, siis alles sai koostada tugevusanalüüsid ning selle järgi korrigeerida mudeleid. Kahjuks valmistasid tugevusarvutused ka natukene pettumust.

Bakalaureusetöö oli autori jaoks huvitav protsess, sest autor valis teda paeluva teema. Huvitav ja tulevikuks kasulik oli põhjalikult uurida antud relva kohta ja hetkel kaitsejõududes kasutuses olevaid süsteeme. Lisaks möödus projekteerimise faas kiiremini, kuna oli huvitav näha, kuidas valmib kast ja väljastussüsteem, millest võiks kunagi abi olla. Tööd tehes tehti ka vigu, mida kindlasti ei tehtaks enam, kui peaks sarnast projekti tegema. Näiteks alustati projekteerimist samal ajal, kui koostati veel

turu-uuringut. Pärast konkurentide analüüsi ja kliendi vajaduste kirjeldamist mõisteti, et peab mõned asjad algusest peale projekteerima. Algselt oli plaan ka prototüüp koostada, kuid üsna ruttu saadi aru, et selline prototüüp maksaks rohkem, kui autor oleks nõus panustama oma isiklikku raha. Käis idee läbi ka teha ainult relvade lukustusüsteemile prototüüp, kuid selle tegemine tühistati ajapuuduse ja ülejäänud bakalaureusetöö suure mahu tõttu. Sooviti teada saada ka sellise kasti maksumus, kuid projekteerimise lõpu poole saadi aru, et Eesti puhul ei ole siiski mõtet koostada kogu kasti, seega ei hakatud arvutama selle hinda. Töö lõppjärelendus on see, et kui kunagi sooviks selle projektiga jätkata, siis targem on hetkel Eestis kasutuses olevatesse kastidesse luua sisu ja relvade lukustusüsteem ning relvaruumid vastavalt ümber teha, et töös kirjeldatud süsteem toimiks. Seda mitmel põhjusel, esiteks ei suudetud kasti teha väiksemaks ega kergemaks, mida algselt loodeti, samuti on sellise konteineri valmistamine väga kallid, tunduvalt odavam oleks luua detaile, mis kohanduvad hetkel olevate kastidega või kui see ei sobi, siis konteinereid lasta luua mõnel ettevõttel, kes sellega tegeleb ja ülejäänud süsteemid ise koostada.

Kokkuvõtteks saab öelda, et jäädi rahule tööga ning autor loodab, et kui ta seda ise kunagi edasi ei arenda, siis vähemalt keegi teeb seda ja kunagi jõuavad sellised süsteemid Eesti kaitsejõududesse.

## Summary

The goals set in the bachelor's thesis were achieved: market research and problem mapping, measuring and modeling the weapon, inventing technical units, designing and strength calculations of the weapon box, designing, documenting and drawing drawings of the weapon box.

The work was divided into six parts:

- First, the currently used solutions were mapped and analyzed. After the first results, it was confirmed that the best boxes and systems for the transport and delivery of weapons are not currently in place. As all the work is very strongly related to a specific weapon, the R-20 weapon was measured and modeled. If you ever wanted to go with such a box, you should definitely scan the gun and use the resulting model, because the survey for the job was not as accurate as it could have been. Next, what the new box should look like was written down and a block logic system was compiled to describe how the delivery of weapons should work.
- In order to understand what problems other users of the boxes see, a market research was carried out, mostly confirming the same problems that the author saw, but a few new ones were added. In order to avoid creating existing solutions, competitors were also analyzed for similar products.
- When all the preliminary work had been done, alternatives were sought and analyzed to find the best solutions.
- Subsequently, the design started, but the material selection got stuck quite quickly. After consulting with lecturer Mart Saarna, it was found where and what materials are worth using.
- The design phase was long and voluminous, but in the end all the necessary assemblies were designed and inspected and finally drawn into drawings.
- When everything was ready, it was only possible to prepare strength analyzes and adjust the models accordingly. Unfortunately, the strength calculations were also a bit disappointing.

The bachelor's thesis was an interesting process for the author, because the author chose a topic that fascinates him. It was interesting and useful for the future to thoroughly study the systems currently in use in the Defense Forces for this weapon. In addition, the design phase passed faster, as it was interesting to see how the box and dispensing system would be completed, which could never help. Mistakes were also made in the work, which would certainly not be done anymore if a similar project were to be carried out. For example, design started at the same time as the market study.

After analyzing the competitors and describing the customer's needs, it was realized that some things had to be designed from the beginning. Initially, the plan was to build a prototype, but it was soon realized that such a prototype would cost more if the author agreed to contribute his own money. The idea was also to make a prototype only for the weapon lock system, but this was canceled due to lack of time and the large volume of the rest of the bachelor's thesis. It was also wanted to find out the cost of such a box, but towards the end of the design it was understood that in the case of Estonia it is not meaningful to make the whole box, so the price was not calculated. The final conclusion of the work is that if you ever want to continue this project, it is wiser to create a locking system for the contents and weapons in the boxes currently in use in Estonia, and to redesign the weapons rooms accordingly so that the system described in the work works. For a number of reasons, firstly, the box could not be made smaller or lighter than originally expected, and it is very expensive to make such a container, it would be much cheaper to create parts that fit the current boxes or deals with it and builds the rest of the systems yourself.

In conclusion, it can be said that they were satisfied with the work and the author hopes that if he never develops it himself, then at least someone will do it and such systems will one day reach the Estonian Defense Forces.