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NATO Helicopter Underslung Load Certification

Joint Air Power Competence Centre

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FROM:

The Executive Director of the Joint Air Power Competence Centre (JAPCC)

SUBJECT:

NATO Helicopter Underslung Load Certification

DISTRIBUTION:

All NATO Military and Civilian Structures, NATO Nations and Partnership Cooperation Menu (PCM) Nations

Responsible to develop standardization within NATO helicopter operations, the NATO Helicopter Inter-Service Working Group (HISWG) identified interoperability of helicopter Underslung Load (USL) operation had deteriorated significantly in the last decade. The JAPCC was therefore requested to investigate the current challenges for helicopter underslung interoperability and provide recommendations on how to overcome these challenges and how to increase the effectiveness of joint helicopter operations.

This White Paper addresses why interoperability in USL operations is not improving despite the fact that NATO standardization on criteria of USLs is available and ratified by the majority of member nations. It describes aspects on communication and knowledge of procedures (e.g. availability of bi-lateral agreements, acceptance of foreign loads, training and currencies of personnel) between nations, the volume of different regulation that can apply to helicopter USL procedures and operations, and the availability of a standardized system for military airworthiness within NATO.

This document concludes with JAPCC's recommendations to improve the communication and information sharing between nations, and the consistency of airworthiness standards within NATO by developing accessible databases. It also gives recommendations to improve the acceptance of foreign USLs during operations and standardization of testing procedures for underslung categories.

I invite you to read through this study and to contact us with any comment or questions. As always, we welcome thoughtful insights from our readers.

Joachim Wundrak
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TABLE OF CONTENTS

EXECUTIVE SUMMARY

One method of quickly employing ground forces is through airmobile operations. When airmobile forces are employed by helicopter, part of their equipment is transported as an Underslung Load (USL) underneath the helicopter. For NATO forces to operate in a combined manner, it is essential that the equipment of one nation be transportable by the helicopters of another nation. Although Helicopter Underslung Load Equipment (HUSLE) and helicopter USL standards are available and approved in NATO, interoperability appears to be limited.

At the request of the 'NATO Helicopter Inter-Service Working Group' (HISWG), the Joint Air Power Competence Centre (JAPCC) completed the study to investigate the current state of interoperability of NATO helicopter USL operations. The primary objective of this study was to produce a NATO USL clearance system that will increase interoperability in USL operations among NATO nations. The study gives an overview of the current Standardization Agreements (STANAGs) and an analysis of data obtained through a questionnaire as well as through meetings and interviews with subject matter experts.

Under direction of the Military Committee Land Standardization Board (MCLSB) the HISWG is responsible for the standardization of helicopter procedures in NATO. Within the HISWG the HUSLE panel is engaged in the development and sustainment of USL standardization. Although USL STANAGs are in place, it has been identified that due to limitations in combined helicopter USL operations, interoperability has deteriorated significantly in the last decade. The reasons found for this can be summarized as:

- unclear procedures;
- lack of standardization;
- lack of documentation sharing;
- differences in HUSLE hardware.

In order to gain insight into the current issues that interfere with interoperability in USL operations, a questionnaire developed by the JAPCC was distributed to NATO and partner nations. Eight NATO nations and two non-NATO HISWG participants responded to the questionnaire.

The responses to the survey showed:

- There is no consistent authority for USL clearances.
- There is no standardized system for Military Airworthiness Authorities (MAAs) within NATO.
- Not all national MAAs appear to be involved in USL clearances.
- Most nations adhere to agreed STANAGs.
- Most nations also have to comply with additional standards and regulations.
- Not all manufacturers conform to STANAG specifications for aircraft hook dimensions.
- Foreign USL are not accepted because of the use of different or unknown standards for personnel and equipment certifications.

Suggested solutions included:

- change national manuals and regulations to conform to STANAGs;
- certify foreign USL according standards of supported nations;
- supporting units carry a secondary hook to adapt to non-standard USL connections;
- have bi-lateral agreements between involving nations;
- establish a NATO central authority.

Most of all: **a simple solution is needed.**

Although one NATO authority providing USL clearances could enhance interoperability, the authority of military airworthiness will remain a responsibility of the national MAAs. Initiatives within NATO for airworthiness standardization resulted in a NATO Airworthiness Policy (NAP), which was approved in 2013. Although not an airworthiness authority, the NATO Aviation Committee (AVC) was established in 2016 as a Tasking Authority (TA) on airworthiness aspects. Without affecting the sovereignty of national MAAs the AVC accepted the development of the NATO recognition Process (NRP) as directed by the NAP.

JAPCC Recommendations

To improve the interoperability during helicopter USL operations, the JAPCC recommends:

To monitor the developments on airworthiness aspects in NATO, to ensure possible positive effects on the standardization of USL certification.

Supporting units should provide a secondary hook during joint USL operations.

The development of a common static test procedure with a common format to report and share the results, in order to provide USL clearances.

The development of USL categories to allow easier acceptance of clearances.

To establish a database, accessible to all nations, containing all USL testing reports and clearances in a standardized format.

The creation of an 'USL interoperability Matrix', accessible to all nations, to improve the sharing of information and common knowledge. The USL Matrix must be secured in an NATO Standard Related Document (SRD).

In addition, the JAPCC recommends that NATO investigate the feasibility for the establishment of a common training centre and/or syllabus for USL-handling personnel.


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CHAPTER 1

Introduction

The essential purpose of the NATO is to safeguard the freedom and security of its members through political and military means. NATO is committed to the peaceful resolution of disputes but if diplomatic efforts fail, it must have the military capacity to undertake combat operations. To retain its ability to respond to crises, NATO has established a Very High Readiness Joint Task Force (VJTF) which is able to deploy within a few days. The force consists of Land, Air, Maritime and Special Forces provided on a rotational basis from all NATO member nations.

One method of quickly employing ground forces is by airmobile operations[1]. This is an operation in which combat forces and their equipment manoeuvre about the battlefield by aircraft to engage in ground combat. When airmobile forces are employed by helicopter, part of their equipment is sometimes transported underneath the helicopter as an Underslung Load (USL).

For NATO forces to operate jointly, it is therefore essential that the equipment of one nation be transportable by helicopters from another nation. Thus, when executing airmobile operations the nations involved need to be interoperable.

To improve interoperability for this capability NATO developed Standardization Agreement (STANAG) 2445, 'Criteria for the Clearance of Helicopter Underslung Load Equipment (HUSLE) and Underslung Loads (USL)'. This STANAG defines the minimum criteria for the clearance, rigging and lifting of helicopter USL and HUSLE.

Within operations any HUSLE and USL must be cleared for flight before use. This clearance, required by each nation for each of its helicopter types, entails 'Airworthiness Clearance' of the HUSLE and clearance of the rigging scheme for each load.

Although NATO has a ratified STANAG 2445 on HUSLE and Helicopter USL many NATO nations do not accept clearances from other nations. This severely hampers NATO interoperability.

The custodian of STANAG 2445, the NATO Helicopter Inter-Service Working Group (HISWG) and the HUSLE panel identified this problem and requested the Joint Air Power Competence Centre (JAPCC) to investigate the problems and provide solutions and recommendations to address them.

1.1 Aim

The aim of this project is to investigate the current state of interoperability with regard to Helicopter USL operations, and provide recommendations on how NATO can create an accepted USL certification system using STANAG 2445 as the reference standard.

1.2 Objectives

Produce a NATO USL Clearance system that will:

- increase interoperability in helicopter operations during NATO-led operations;
- allow nations to accept each other's USL;
- improve USL clearance acceptance;
- reduce costs and duplicative testing of identical or similar equipment by multiple nations and yield standardized NATO-wide USL clearances;
- minimize the occurrence of flight safety incidents;
- improve ability of NATO commanders to integrate available aviation capabilities.
- Allow combined joint aviation forces to conduct operations together rather than being separated along national lines.

1.3 Scope

The study provides guidance to the HISWG and the HUSLE panel as well and to NATO nations that have established helicopter clearance organizations on what would be required to establish a NATO USL certification system.

1.4 Project Description

This project started with background information on USL standardization and describes the current NATO STANAGs that are in place. Then, data gathered from NATO nations in reply to a questionnaire was analysed. Subsequently data collected at the HUSLE panel meetings and in interviews with national helicopter underslung agencies and subject matter experts was analysed as well. Finally, recommendations are provided for NATO and for nations to improve interoperability during helicopter underslung operations.

1. NSO/NATOTerm, The Official NATO Terminology Database.

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CHAPTER 2

Background

2.1 NATO Standardization

2.1.1 It has been long recognized by NATO that the co-ordinated development of policies, procedures and equipment of the member nations hold great potential for enhancing the military effectiveness and efficiency. Therefore, in January 1951 the 'Military Standardization Agency' (MSA), one year later renamed to 'Military Agency for Standardization' (MAS), was established for the purpose of developing the standardization of operational and administrative practices and war material. In 2001, the MAS was combined with the 'Office for NATO Standardization' establishing the 'NATO Standardization Agency'[1] (NSA). From July 2014, as a result of the NATO Agencies Reform, the NSA became the 'NATO Standardization Office' (NSO). The NSO, acting as an independent NATO Office, reports to the Committee for Standardization (CS) and the 'Military Committee' (MC), for corporate oversight and issues relating to operational standardization.

2.1.2 The NSO supports the development and implementation of concepts, doctrines, procedures and designs to achieve and maintain the compatibility, interchangeability and commonality which are necessary to attain the required level of interoperability, or to optimize the use of resources, in the fields of operations, material and administration[2]. The primary products of this process are NATO standards covered by STANAGs between the member nations.

2.2 Helicopter Standardization

2.2.1 The HISWG under direction of the 'Military Committee Land Standardization Board' (MCLSB) initiates and develops standardization procedures for helicopter operations related to land warfare. To accomplish this the HISWG[3] has two panels, the Helicopter

Operations panel and the HUSLE panel, with representation from NATO-Commands, Agencies, and organizations. The HUSLE Panel was formed to implement helicopter underslung and internal load interoperability between nations.

2.2.2 The HUSLE panel has developed four STANAGs that deal with helicopter underslung load standardization and has been maintaining these STANAGs for over two decades. They review them at least every three years and amend them with the lessons identified and learned from recent operations.

2.2.3 Even after the implementation of three specific USL STANAGs, the HISWG and HUSLE chairmen have identified that there are still a lot of limitations in joint operations with helicopter USLs. According to long-time HUSLE panel members, interoperability has deteriorated significantly in the last decade.

2.2.4 The JAPCC was requested to investigate the current challenges for helicopter underslung interoperability and provide recommendations on how to overcome these challenges and how to increase the effectiveness of joint helicopter operations[4].

2.2.5 The JAPCC is well aware that in today's times of financial austerity, recommendations that require additional funds will require lengthy national assessments and will likely not meet national priorities. Nevertheless the JAPCC is convinced that the publication of our findings will improve awareness of the complex challenges that exist in joint helicopter operations and contribute to greater helicopter interoperability in future NATO-led operations.

1. NATO policy for Standardization, C-M(2010)0063.
2. NATO Policy for Interoperability, C-M(2009)0145.
3. TERMS OF REFERENCE (TOR) FOR HELICOPTER INTERSERVICE WORKING GROUP (HISWG) NSO (ARMY) 1325(2015)1/HIS, 8 Oct. 2015.
4. Request for Support from Helicopter Interservice Work Group formerly Chairman Col Dr Volker Bauersachs 01102015.

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CHAPTER 3

NATO Underslung STANAGs

3.1 Overview

3.1.1 The HUSLE panel is responsible for four STANAGs concerning helicopter underslung equipment:

- STANAG 2445:
  Criteria for the Clearance of HUSLE and USL;
- STANAG 3542:
  Technical Criteria for the Transport of Cargo by Helicopter;
- STANAG 2286:
  Technical Criteria for External Cargo Carrying Slings, Nets and Strops/Pendants;
- STANAG 2970:
  Aerial Recovery Equipment and Techniques for Helicopters.

3.2 STANAG 2445

Criteria for the Clearance of HUSLE and USL

3.2.1 The aim of this STANAG is to define the minimum criteria for the clearance, rigging and lifting of helicopter underslung loads to permit interoperability. The participating nations agree to follow the criteria described in the document for airworthiness clearance of HUSLE and clearance of the rigging scheme.

3.2.2 According to the STANAG within 'cross-operations'[1], it is agreed that the supported nation (nation whose load is being transported) is to rig the load in accordance with national procedures of the supported nation. Subsequently it is agreed that each helicopter should be handled by trained personnel in accordance with the syllabus in Annex B of STANAG 2445.

3.2.3 Training of helicopter handlers. ANNEX B of STANAG 2445 is the syllabus outlining the training of helicopter handlers and defines the minimum requirements. It states that training will be done by an agency nominated by the nation and will contain in the annex eight prescribed topics. Training should be practical and theoretical and be re-examined annually.

3.2.4 STANAG 2445 is ratified by 23 nations. 13 nations have implemented this STANAG and 10 nations committed to future implementation[2].

3.3 STANAG 3542

Technical Criteria for the Transport of Cargo by Helicopter

3.3.1 The aim of this STANAG is to define the criteria for the design of equipment that is used in transport of cargo by helicopters. The nations agree to apply the criteria described for the carriage of cargo by helicopter.

There are two major sections dealing with criteria. The first section addresses internal loads while the second discusses the carriage of external loads. This study will only focus on external loads.

3.3.2 The criteria for external cargo determines sling load factors; cargo hook capacity, dimensions and operation; attachment rings or shackles; slings, strops/pendants and swivels. It has several criteria for the suspension points on cargo describing location, dimension and strength.

3.3.3 For 'cross operations', it states that: 'all equipment used will be duly licensed/certified according to national regulations of the nation providing the equipment and operated in accordance with the operating instructions'.

3.3.4 STANAG 3542 is ratified by 22 nations. 20 nations have implemented this STANAG and 2 nations committed to future implementation[3].

3.4 STANAG 2286

Technical Criteria for External Cargo Carrying Slings, Nets and Strops/Pendants

3.4.1 The aim of this STANAG is to provide technical criteria for the design of slings and strops/pendants for capacities up to 20,000 kilograms and for nets with capacities up to 10,000 kilograms.

3.4.2 STANAG 2286 hosts a detailed description of the design of slings, nets and strops/pendants. It also contains criteria for material, strength markings, maintainability and reliability.

3.4.3 All components attached to a helicopter hook should be compatible with the criteria described in STANAG 3542.

3.4.4 STANAG 2286 is ratified by 22 nations. 19 nations have implemented this STANAG and 3 nations committed to future implementation[4].

3.5 STANAG 2970

Aerial Recovery Equipment and Techniques for Helicopters

3.5.1 The aim of this agreement is to provide performance requirements and recovery techniques to transport downed helicopters. The participating nations agree to furnish verified rigging procedures for use by the nation that carries out the recovery.

3.5.2 The STANAG describes that rigging procedures shall be established and the equipment needs to provide safe restraint and in-flight suspension. It also mentions specialized equipment like rotor head slings, gust locks, spoilers and drogue chutes that could be used.

3.5.3 The primary purpose of this STANAG is to provide guidance on how to transport downed helicopters from remote sites without incurring additional damage to the helicopter.

3.5.4 All pendant/strop should be compatible with STANAG 3542.

3.5.5 STANAG 2970 is ratified by 23 nations. 14 nations have implemented this STANAG and 9 nations committed to future implementation[5].

3.6 STANAG Review

3.6.1 In the development of these standards, interoperability and 'cross operations' has been a pivotal issue. The aim of all four standards was to get the nations to agree on criteria for the clearance of underslung loads, the design of equipment, usage of material and even training of personnel.

3.6.2 When reviewing the relevant STANAGs on USL operations, it would appear that helicopter USL operations are well regulated within NATO and that the vast majority of nations have ratified and implemented the STANAGS. The STANAGS are dated 28 February 2011, so it is to be expected that the nations that implemented the standard or have committed to future implementation would have had sufficient time to implement these standards. So why would NATO experts in the HUSLE Panel assess underslung interoperability to be almost non-existent? According to some experts who attended the 41st HISWG meeting in Atlanta in April 2016, interoperability is less than it was 12 years ago.

3.6.3 To understand the current issues that hinder helicopter underslung interoperability, the JAPCC created a questionnaire for NATO's underslung subject matter experts. The questionnaire was distributed to the nations via the HISWG and Joint Capability Group Vertical Lift (JCGVL) secretaries. The results of the questionnaire will be discussed in the next chapter.

1. Not an official NATO definition. Within this study it is intended: The movement of loads cleared and rigged by one nation, to be lifted by a rotary wing aircraft of another nation.
2. NSO Ratification details for STANAG NO. 2445 Edition 4 as of 6 Jun. 2016.
3. NSO Ratification details for STANAG NO. 3542 Edition 6 as of 6 Jun. 2016.
4. NSO Ratification details for STANAG NO. 2286 Edition 2 as of 6 Jun. 2016.
5. NSO Ratification details for STANAG NO. 2970 Edition 3 as of 6 Jun. 2016.

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CHAPTER 4

4.1 Questionnaire

4.1.1 The JAPCC together with the HUSLE panel chairman developed a 15-question questionnaire (Annex A) that was distributed to the nations in January 2016.

4.1.2 The JAPCC received ten responses from eight different nations. One nation provided three responses, from the responsible Joint organization down to the operators at the squadron level. Two NATO partner nations that attend the HISWG regularly also provided valuable answers.

4.1.3 The JAPCC would have welcomed more responses from the nations since the majority of NATO nations perform underslung operations. Although only ten total replies were received, we assessed that since the nations that did respond represent over half of NATO's helicopter fleet, the answers are representative of the current situation within the Alliance. The next paragraphs provide the results of the questionnaire.

4.2 Answers

4.2.1 The initial two questions were, 'Does your nation perform USL operations? And, does your nation develop USL clearances?' All ten organizations that replied perform underslung operations. One nation does this without issuing national clearances. The nation without national clearances has limited national regulations and their primary procedures with regard to maximum weight for underslung loads come from the aircraft manufacturer.

4.2.2 Who provides clearances? The next question looked into who provides USL clearances for the nation. Three nations have a joint agency providing clearances for all services. Two nations that replied rely on the Army to provide clearances and one nation relies on the Air Force to provide clearances. One nation answered that each branch develops their own clearances.

4.2.3 The role of Airworthiness Authorities. As mentioned, the clearance for using HUSLE and USL in operations is dependent on 'Airworthiness Clearance'

of the HUSLE and clearance of the rigging scheme for each load. Airworthiness clearances and certifications remain the responsibility of national airworthiness authorities. The JAPCC looked into the national airworthiness authority's role in providing HUSLE and USL clearances. There is no standardized system for military airworthiness authorities within NATO. This is in contrast with civil aviation. Therefore it is very difficult to compare the answers of the eight nations. For most nations there is no direct involvement of the airworthiness authority in the creation of USL clearances. For some of the nations, airworthiness is a component responsibility.

4.2.4 Adherence to agreed STANAGs. Three of the nations adhere directly to the STANAGS while two other nations observe the STANAGS but have additional national regulations. One partner nation strictly adheres to civilian regulations.

4.2.5 Additional national standards. On the question of national regulations differing from NATO STANAGs, three nations answered that they had no additional regulations. The other five nations have additional regulations on top of the NATO standard. One nation does have a lower ultimate load than required by STANAG 3542 but is correcting its national regulations so that they are in line with the STANAG.

4.2.6 Training of personnel. This question was to investigate if helicopter handling and rigging personnel (e.g. landing point commander, landing site personnel, rigger marshaller) are trained and if there is a national currency requirement after the initial training. All nations have a training programme for helicopter handling and rigging personnel. Only one nation has an annual currency requirement for helicopter handling and rigging personnel and one other nation has a two to three year currency requirement.

4.2.7 Acceptance of foreign loads. All nations can accept foreign loads but there are major differences in the procedures of how to accept these loads. The strictest nation accepts foreign loads only after a formal assessment of static and flight testing procedures and the signature of a bi-lateral agreement. Some nations accept loads when there is an operational necessity and one nation will accept other loads if their own national HUSLE is used.

4.2.7.1 The major obstacles to accept a foreign USL include: the lack of standardization, the use of different standards, the lack of shared documentation and clearances and unknown equipment and standards.

4.2.7.2 Of the nations that have ratified the STANAGS regarding HUSLE and USL, to use helicopter USL within NATO and Coalition operations, there are bi-lateral agreements between three NATO nations to allow for the acceptance of loads. Three nations have national regulations on how to accept foreign loads. The other five nations answered that there are no clear procedures or documentation that allow them to accept other nation's clearances.

4.2.7.3 One nation answered that even though STANAG 2445 provides the possibility to give a blanket clearance to a nation if there is confidence in the nation supplying the load, they always require a full examination of all aspects of certification and training.

4.2.7.4 Other factors that limit interoperability are national regulations that require different HUSLE, rings, shackles and hardware which do not conform to STANAG 2286.

4.2.8 Suggested solutions. In the questionnaire we requested the nations to provide feedback on how

interoperability and foreign load acceptance could be improved. We received several possible proposals:

- National manuals and regulations to improve acceptance of foreign loads.
- Certify foreign loads according national standards of the supported nation.
- Hook the foreign load onto a secondary hook, supplied by the nation that will fly the load (the supporting unit), because some manufacture do not comply with STANAG 3542, concerning the helicopter cargo hook.
- Have bi-lateral agreements between all nations involved.
- Establish a NATO central authority who should approve national clearances according to common standards.

4.2.9 National airworthiness standards appear to differ despite largely being replicated in civil regulations. STANAGs as standards within NATO operations are being followed, but are also subordinate to national requirements. Understanding these requirements is often the limiting factor.

4.2.10 Probably the best remark was made by an operational unit[1] that regularly performs underslung operations: 'Most of all, we need a solution that is simple.'

4.3 HUSLE Panel Meeting

4.3.1 The preliminary results of the questionnaire were discussed during the HUSLE panel meeting of April 2016 and some additional points of view were offered by the representatives.

4.3.2 It was mentioned that it appears the HUSLE STANAGS are applied differently during exercises and operations. Risk acceptance appears to be higher during operations and the technical criteria of the STANAGS are of lesser concern.

4.3.3 One nation established different procedures for certified loads and uncertified loads, where the decision to transport uncertified loads is left up to the helicopter crew. This is contradictory to one nation who stated that command-level approval is needed to transport loads that are not certified by their own nation.

4.3.4 Certification and the correct rigging of material is of the greatest interest to the owner of the material. A nation does not want its equipment to be dropped and damaged by a helicopter. Therefore, 'if you own it, you rig it and it is your responsibility'.

4.3.5 During the meeting it also became clear that a lot of different regulations can apply to USL procedures. There are different requirements and regulations for the aircraft and aircrew for HUSLE, for the load and for helicopter handling personnel.

4.3.6 There is a difference between nations in the way loads are tested for flight. The strictest nation requires every load to be test flown by every type of helicopter, while other nations only require one test flight to fulfil the requirements. A third variant is that a single-point load[2] requires a test flight independent of aircraft type and dual-point load[3] require a test flight for every type of helicopter before a clearance can be provided.

1. Helicopter Underslung Load (USL) questionnaire, response of United States Marine Corps.
2. USA, Department of Defence, MIL-STD-913A: Single-Point Loads – one load which is suspended from a single hook on the aircraft.
3. USA, Department of Defence, MIL-STD-913A: Dual-Point Loads – one load which is suspended from two single hooks on the aircraft.

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CHAPTER 5

Solutions

5.1 NATO Certification Authority

5.1.1 The initial proposal of the HUSLE panel for this study was to investigate if it would be feasible to create a NATO certification authority for underslung clearances[1]. One NATO authority that could provide clearances in full compliance with all STANAGs that are accepted by all nations would greatly enhance interoperability.

5.1.2 Within NATO there have been initiatives for military airworthiness standardization. In 2006, the Airworthiness Ad-Hoc WG was established followed by the establishment in June of 2010 of the NATO Airworthiness Work Group (AwWG), which developed a NATO Airworthiness Policy[2] (NAP) that was approved by the North Atlantic Council (NAC) on 18 July 2013.

To provide clear advice to the NAC, the NATO Aviation Committee (AVC), as the Tasking Authority (TA) on airworthiness aspects, was established in 2016. As a replacement of the AwWG, the NATO Airworthiness Advisory Group (AWAG) was established by the AVC. As a Delegated Tasking Authority (DTA) the AWAG is responsible for advising and making recommendations to the AVC and the NATO Airworthiness Executive (NAE). The NAE is an independent executive officer empowered in the NAP with responsibilities to execute the NAP Implementation Plan: 'to perform a coordinating oversight function to establish a robust framework that ensures airworthiness of all aeronautical products, parts and appliances provided by NATO and Partner nations in the context of NATO and NATO-led missions and operations'. The NAE is therefore not an authority.

5.1.3 The authority over military airworthiness of state-owned aircraft is still a national responsibility, regulated by the national Military Aviation Authority (MAA). Since all MAAs follow their national policies,

the NAP directed the development of effective processes for MAA recognition. The AVC accepted the recognition process[3] (structural assessments of MAAs without affecting their sovereignty) developed by the European Defence Agency (EDA) to guide the development of the NATO Recognition Process (NRP).

5.1.4 The JAPCC recommendation is to keep monitoring the ongoing developments within the NAP Implementation Plan, in order to identify possible effects and use within NATO underslung operations and underslung certifications.

5.2 Common Static Testing Procedure

5.2.1 STANAG 2445 specifies that 'any HUSLE (including nets) and loads must be cleared for flight before use'. Netted loads will have to meet the requirements specified in STANAG 2286. Rigged loads require a clearance after completion of a load assessment, sling scheme design, static testing and flight trial. All the results should be documented and be provided in a clearance. As previously mentioned (4.3.6) there are different procedures between nations for flight trials of USLs. Interoperability could already be improved with the establishment of a common static testing procedure after which nations can decide to perform their own national flight trials.

5.2.2 STANAG 2445 does not provide detailed information on the method of static testing[4], and sharing the results of the testing. It has been found that static testing results are not shared between nations. If the nations could agree on a common static test procedure and the usage of one common format to report the results, this could be shared and would increase interoperability.

5.2.3 When all nations understand how a load assessment is done, which sling scheme is used and what steps are completed before and during the static testing, the nations could then decide to accept a static testing report. This could then absolve them of performing their own static testing.

5.2.4 When a flight test with a nation's specific type of helicopter is required after the static testing, then the available static testing data can be used. This can result in substantial saving by not having to perform static testing on equipment that is already certified by an allied nation.

5.3 Load Categories

5.3.1 Cargo nets that meet the criteria of STANAG 2286 and which have been given a clearance to fly as HUSLE with a nation may be transported without an individual clearance. Therefore it should be fairly easy for another nation to accept a netted load.

5.3.2 For some nations, the acceptance of the clearance of a standard container could possibly be easier than the acceptance of the clearance of a trailer wagon only used by that specific nation.

5.3.3 Therefore the acceptance of a foreign clearance for one type of load can be different from accepting a clearance of the same foreign nation for a different type of load.

5.3.4 The JAPCC recommends to design underslung categories that will make accepting foreign underslung clearances easier. The creation of the different categories would need to be done by underslung Subject Matter Experts (SMEs) from the HUSLE Panel in cooperation with logistics SMEs from the Logistics Committee Standardization Working Group (LCSWG).

5.4 Technical Solutions – Secondary Hook

5.4.1 Although STANAG 3542 provides specific dimensions and requirements for cargo hooks and dimensions for the attachment rings or shackles, some aircraft manufacture's do not comply with this STANAG and require different and very specific dimensions for shackles. At the same time it is sometimes necessary to attach steel cables, ropes or webbing to a hook which can be prohibited by some manufactures.

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5.4.2 To overcome the limitations that some manufacture's put on their primary helicopter cargo hook, the supporting nations should provide a secondary hook. A secondary hook is a short strap that, according the limitations of the manufacturer, can be attached to the primary (helicopter) hook. At the other end of the strap there should be a NATO standard shackle that can be accepted for most HUSLE. By using these secondary hook compliance with all national and NATO requirements is ensured.

5.5 Clearance Database

5.5.1 One of the major factors hindering underslung interoperability is the lack of information sharing on clearances and unknown equipment and standards information (4.2.7).

5.5.2 The JAPCC recommends that all USL clearances are made accessible to all nations. This would require development of a database that is accessible to all nations. The database should contain all underslung clearances and all reports of the standardized static load test as described in paragraph 5.2.

5.5.3 The database would require nations to provide the required information uniformly. With the clearance, detailed information is required on the equipment used and on the standards that were used in creating the clearance. This is especially true if these are different or additional to NATO STANAGs.

5.5.4 The database could avoid duplication of effort, by not having to create a unique national clearance. Additionally it could reduce the national effort required to create a clearance by adapting the work already completed by other Allied nations.

5.5.5 To make the clearance database successful, nations must be willing and able to share data. The sharing of information could require some level of security classification. The individual nations must investigate if sharing underslung information is bound by any legal restrictions. Also, the HUSLE panel should determine what the best organization would be to maintain a clearance database.

5.6 Interoperability Matrix

5.6.1 Because of national differences and caveats, it will be challenging or possibly unachievable to develop an underslung clearance system that provides a solution for all Allied nations. There still is currently an operational need for USL interoperability that may increase even more in the future. At the current time there are nations that have established bi-lateral agreements to accept underslung clearances. There are some nations that accept most foreign clearances and there are nations that don't accept any clearance without complete evaluation of all aspects of underslung operations.

5.6.2 To help inform what is possible regarding underslung operations, the JAPCC recommends to create an underslung interoperability matrix similar to the JAPCC Air-to-Air Refuelling (AAR) matrix[5]. This underslung interoperability matrix would provide a clear overview that displays which nation can accept what load.

5.6.3 At this time, there is no underslung clearance matrix and no underslung clearance request procedure. The JAPCC recommends the HISWG and HUSLE panel develop these using the methods described in the following paragraphs.

5.6.4 The underslung clearance matrix needs to be part of a Standard Related Document (SRD) that would explain the generic clearance assessment process. The clearance process should include the following steps:

- legal and finance;
- technical;
- static testing;
- flight testing;
- documentation assessment;
- mutually agreed minimum maintenance;
- mutually agreed minimum training and currencies.

A decision chart showing this generic clearance process is included at Annex B.

5.6.4.1 Legal and Finance. The first step after receiving a request for underslung operations is to analyse if it is in compliance with national legal regulations and if there are any required financial agreements. Part of this could be covered by NATO Status of Forces Agreements or bi-lateral or multi-lateral agreements. If these prerequisites are not in place, the process would stop.

5.6.4.2 Technical. For the technical pillar it should be determined if the load and the helicopter are compatible and if the technical criteria of STANAG 3542, as well as any additional national requirements are met.

5.6.4.3 Static and Flight testing. The next step in the process is to assess the static testing of the load. This static testing should preferably be completed by the requirements set out in common agreed static testing procedure as described in paragraph 5.2. Flight testing would then be completed. Not all loads would require flight testing. For example, it can be determined if a load that has been flight tested by another nation can be accepted.

5.6.4.4 Documentation assessment. During the documentation assessment all gathered information from the previous steps should be collected and provided in a standard format usable for all operators.

5.6.4.5 Maintenance. In step 6, HUSLE maintenance assessment, minimum maintenance requirements and inspections frequencies are established. This is currently an item which varies greatly between nations.

5.6.4.6 Training and Currency. The last step is the assessment of Aircrew and helicopter handling personnel minimum training and currencies. Training and currencies are a pure national responsibility. During this assessment it has to be decided if nations are accepting each other standards.

5.6.5 If all these steps are successful, a clearance can be provided and the results should be published in the NATO underslung interoperability matrix.

5.6.6 The JAPCC recommendation is to start filling out the matrix with countries who already have an established Memorandum of Understanding (MOU) for interoperability. The matrix should be maintained by a custodian. New underslung clearance requests should follow the described underslung clearance process and should be performed by the two nations that require interoperability, the results should then be provided to the custodian of the matrix to be included.

5.6.7 The matrix should be accessible to all, and is the simple solution for the operators.

1. Request for Support from JAPCC by HUSLE Panel Chair. JADTEU/059/CT/HELS.
2. NATO Airworthiness policy C-M(2013)0035).
3. European Defence Agency, MAWA Forum: European Military Airworthiness Document – Recognition (EMAD-R).
4. USA, Department of Defence, MIL-STD-913A: 'Static lift test': A test in which the item (load) is suspended in the proposed helicopter sling loading rigged configuration without movement; Flight test: A test in which the item (load) is rigged in its helicopter sling loading configuration and flown through specific manoeuvres by military rotary wing aircraft.
5. https://www.japcc.org/aar/matrix/

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CHAPTER 6

Conclusions and Recommendations

6.1 Conclusions

6.1.1 NATO has three active STANAGS specific for USL, yet according to the experts, underslung interoperability is almost non-existent. And according to some experts, interoperability is less than 12 years ago.

6.1.2 The JAPCC conducted a study to investigate NATO underslung interoperability; we sent out questionnaires, attended meetings and interviewed SME. Ten responses were received from eight different nations, and concluded that eight nations perform underslung operations.

6.1.3 Although an airworthiness policy is accepted, the JAPCC assessed there is no standardization in military airworthiness within NATO.

6.1.4 Most nations do follow the ratified STANAGS, however interoperability seems hampered because of additional national regulations or helicopter manufacturers do not comply with the STANAGs.

6.1.5 There is a difference in the requirements for test flights. Some nations require just one test flight by a helicopter, and other nations require all loads to be test flown by every different type of helicopter.

6.1.6 There are differences between national standards for training and currency of helicopter handlers.

6.1.7 There is very limited acceptance of a foreign load because of:

• unclear procedures;
• lack of standardization;
• lack of sharing of documentation;
• difference in HUSLE hardware.

6.1.8 At the tactical level there is a need for a simple solution.

6.2 Recommendations

6.2.1 It is recommended to monitor the ongoing developments on airworthiness aspects within NATO. Developments of the NATO Recognition Process could have significant effect on the standardization of certification of USL within NATO operations.

6.2.2 Supporting helicopters should provide a secondary hook, both certified for theirs helicopter and NATO standards.

6.2.3 It is recommended the HUSLE panel should develop a common static test procedure with a common format to report the results, these reports should then be shared to increase interoperability.

6.2.4 The JAPCC recommends to investigate the feasibility for the establishment of a common training centre and/or syllabus for handling personnel, to ensure acceptable USL qualification and currencies baselines.

6.2.5 To improve interoperability within USL, and act as an information source in favour of the NRP, the JAPCC recommends:

- The HUSLE panel, in cooperation with the LCSWG, develop underslung categories that allow easier acceptance of clearances and greater interoperability.
- To establish a database accessible to all nations containing all underslung static testing reports and underslung clearances in a standardized format.
- The HISWG create an underslung interoperability SRD and matrix. The matrix should be kept up to date by the custodian and accessible to all Allied nations.

6.2.6 The recommendations, if endorsed by the HUSLE panel, should be distributed to all commanders of helicopter operations of involved nations and NATO organizations.

ANNEX A

USL Questionnaire

1. Does your nation perform helicopter underslung load operations?

2. Does your nation develop national USL clearances?

3. Who or which department provides the USL clearances? Are these joint clearances or does each branch provide its own clearances? Can you provide a POC?

4. Does your Airworthiness Authority have a role in providing USL clearances? Can you provide an Airworthiness Authority POC?

5. Does your nation adhere to STANAG 2445 Criteria for the clearance of helicopter underslung load equipment?

6. Does your nation adhere to STANAG 3542 Technical criteria for the transport of cargo by helicopter?

7. Do you have additional national standards for USL clearances? Do these standards differ from the existing STANAG's? Can you provide the JAPCC those national standards?

8. Is your helicopter handling and rigging personnel trained, qualified and or certified? Is there a currency requirement for helicopter handling and rigging? Can you provide the JAPCC with your national training and qualification requirements?

9. Does your nation accept foreign loads?

10. Are there procedures and/or documentation that allows your nation to accept other nations' USL clearances? Can you share those documents?

11. What is required to accept other nations' USL?

12. What hinders you in accepting other nations' USL clearances?

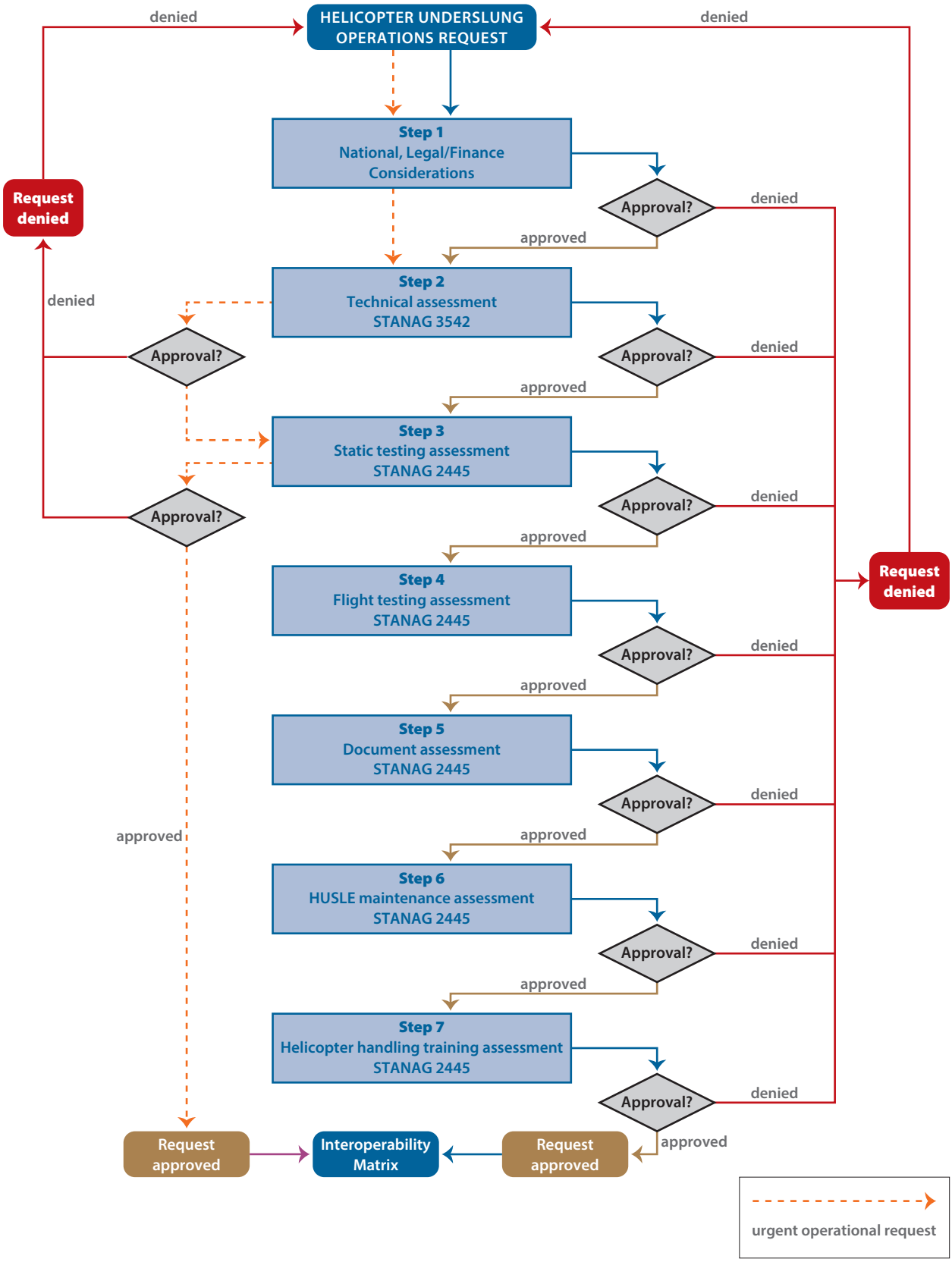
13. What, in your opinion, needs to be done before you can accept other nations' USL clearances?

14. Does your nation has helicopter underslung lessons learned or flight safety incidents that would provide the project team with additional insights in underslung operations?

15. Do you have any more information or comments that can help the JAPCC in providing answers to NATO on how to increase interoperability for helicopter underslung operation?

ANNEX B

Clearance Assessment Process



ANNEX C

Acronyms and Abbreviations

AAR	Air-to-Air Refuelling
AVC	NATO Aviation Committee
AWAG	NATO Airworthiness Advisory Group
AwWG	NATO Airworthiness Work Group
CS	Committee for Standardization
DTA	Delegated Tasking Authority
EDA	European Defence Agency
EMAD-R	European Military Airworthiness Document – Recognition
HISWG	NATO Helicopter Inter-Service Working Group
HUSLE	Helicopter Underslung Load Equipment
JAPCC	Joint Air Power Competence Centre
JCGVL	Joint Capability Group Vertical Lift
LCSWG	Logistics Committee Standardization Working Group
MAA	Military Airworthiness Authority
MAS	Military Agency for Standardization
MC	Military Committee
MCLSB	Military Committee Land Standardization Board
MOU	Memorandum of Understanding
NAC	North Atlantic Council
NAE	NATO Airworthiness Executive
NAP	NATO Airworthiness Policy
NATO	North Atlantic Treaty Organization
NSA	NATO Standardization Agency
NSO	NATO Standardization Office
PCM	Partnership Cooperation Menu
POC	Point of Contact
SME	Subject Matter Experts
SRD	Standard Related Document
STANAG	Standardization Agreement
TA	Tasking Authority
USL	Underslung Load
VJTF	Very High Readiness Joint Task Force

Notes

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