

ClassNK

MAGAZINE

September 2018 - 84th Edition

- ◆ *Hamburg: a centre for excellence*
- ◆ *Preparing for an automated world*
- ◆ *Survey drones take off*



Behind the scenes

Welcome to the 84th edition of the ClassNK Magazine



We are living in an era in which unprecedented changes in technology are taking place at a pace more rapid than ever before. However, inventions do not always reap benefits on their own. The application of these technological developments should be common to each business and provide real solutions to challenges industry players are facing. It is essential to see how a certain technology can be practically applied and used in a productive and sound manner.

We are expecting to improve or even revolutionize the way we conduct required checks in our business of surveys and inspections onboard, in shipyards, or in factories and plants with the assistance of remote survey tools. ClassNK has worked on the detailed examination and verification of new tools so that we can apply them to our day-to-day business most efficiently. Recently ClassNK has issued new guidelines for the use of drones in class surveys, and an article in this edition covers how our team in charge has studied and tested drones in the field to develop these practical guidelines.

Our approach of placing value on practicality is also reflected in another new set of guidelines concerned with the concept design of automated operation/autonomous operation of ships. With more efforts recently being made to maximize the potential of unmanned navigation through automation, results are starting to be seen across multiple industries including the shipping industry. On top of providing the necessary technical guidance, we will continue supporting and backing up the latest technological concepts through careful research and experiments to ensure our mission

for the safety of life and property at sea, and the prevention of pollution of the marine environment.

This edition focuses on our activities in Germany, one of the most influential nations in terms of ship ownership, technical capability, and visions for a better maritime future. Over recent years ClassNK has rapidly gained trust from the local maritime community. In a special interview for this issue, the new head of ClassNK Germany highlights ClassNK's in-depth background and the path it has taken to increase its presence in the country. We are also delighted to present testimonial articles featuring the voices of prestigious companies in Germany.

ClassNK will always be ready to provide its vast knowhow and support to the maritime industry during these times of rapid change.

I hope you enjoy this edition of the ClassNK Magazine.

Koichi Fujiwara, President & CEO

ClassNK





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Guidelines for automated ships

01 June 2018 – ClassNK released its Guidelines for Concept Design of Automated Operation/ Autonomous Operation of ships. ClassNK developed these Guidelines with safety in mind in order to address the elements which must be considered in the concept design of automated ship operation systems. As the onboard operations and duties performed by ships' crews vary widely, design developments for automated ship operation are expected to be carried out under various conditions and concepts. Since there will likely be a variety of different design developments when it comes to the automated operation of ships, the Guidelines have been published as a "provisional version" which will be finalized through proper review and revision after being applied for a certain period of time. ClassNK also plans to develop further guidelines for various stages on the automated operation of ships from development of design to actual operation. For further information see *pp. 12-13*.

New LNG carrier requirements

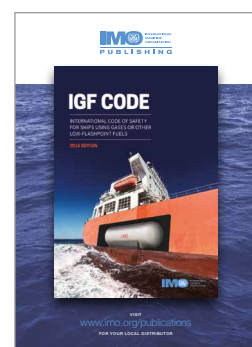
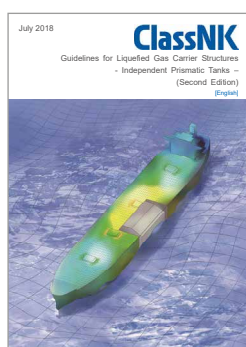
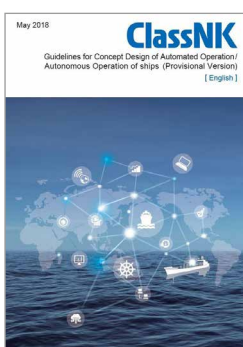
07 June 2018 – ClassNK released its Guidelines for Liquefied Gas Carrier Structures – Independent Prismatic Tanks. The Guidelines indicate the technical requirements specifically related to the structural strength assessments of LNG carriers by using direct calculation. The first component of the Guidelines (Guidelines for Direct Strength Analysis, and the Guidelines for Fatigue Strength Assessment) specifies yield strength and buckling strength by direct strength analysis, using the net scantling of primary structural members as well as ClassNK Guidelines for the structures of other ship types. In addition, the Guidelines feature specific requirements for assessment methods taking account of the complex interaction of loads between hull structures and cargo tanks independent of the hull structures. The other component (Guidelines for Fatigue Strength Assessment) outlines strength assessment methods against fatigue cracks caused to vessels by prolonged and repeated loads, making it possible to carry out more reasonable fatigue designs based on the latest knowledge acquired through Class NK's R&D.

ClassNK Port State Control Annual Report

27 June 2018 - ClassNK released its annual report on Port State Control which aims to assist ship operators and management companies in maintaining compliant operations by providing information about ships detained by PSC as well as deficiencies that were found on board from many port states in 2017. To help its customers improve safety management systems and overall fleet quality, ClassNK has included a breakdown of deficiencies which shows that fire safety-related issues continue to be the most frequent detainable deficiencies item. ISM, lifesaving appliances and safety of navigation also remain major items where many detainable deficiencies are found. The ClassNK report also provides detailed analyses on PSC detentions by flag state, port state, ship type, ship size, and ship's age as well as a summary of major amendments made to international conventions such as the SOLAS Convention.

AIP for LNG-fueled NYK/JMU bulker

05 July 2018 – ClassNK granted an Approval in Principle (AIP) based on its Rule Part GF which adopts IGF Code (regulation for ships using low-flashpoint fuels) for the concept design of an LNG-fueled 200,000 DWT bulk carrier jointly developed by NYK Line and Japan Marine United (JMU). The design is based on a 200,000 DWT bulk carrier developed by JMU. Despite additional weight due to the increased amount of equipment, such as its LNG-fueled tank and LNG fuel supply system, the design envisages more cargo hold capacity. By running on LNG, in addition to reducing NO_x, SO_x, and PM emissions, this vessel is expected to satisfy Phase 3 (30% less than Phase 0) of the EEDI (Energy Efficient Design Index) defined by the International Maritime Organization (IMO) for ship GHG emissions.



Hamburg: a centre for excellence

An interview with Mr. Akizumi Miura, General Manager, ClassNK Hamburg office

Congratulations on your recent appointment as General Manager of ClassNK Hamburg office. Now that you have returned to Hamburg, could you outline the objectives that have been agreed for you in your new role?

As a survey office in Hamburg, we are involved with ship surveys and audits/surveys of material, equipment, and hull fittings for clients in Germany, the Czech Republic, and Slovakia. Caring for our local German shipping company clients is also the responsibility of the Hamburg office.

The German shipping industry greatly expanded in the early 2000s and according to statistics of the VDR (German Shipowners' Association), it became the third largest in the world after Japan and Greece. Naturally, ClassNK has firmly established

itself in Japan and is also one of the top classification societies in Greece. My objective is to make ClassNK's existence well-known in Germany too, and to make sure it maintains a strong share of classified ships and continues expanding in order for ClassNK to remain a leading classification society globally.

This is not your first role in Hamburg, of course, as you were ClassNK Survey Department Representative in Hamburg 2011-2016, during a remarkable period of expansion for ClassNK in Germany. What do you consider the main achievements for ClassNK in Germany during that time?

We made sure that we provided the same quality of service that ClassNK offers to its clients in Japan and Asia, without the time difference, by opening our technical survey de-



partment for Europe in Hamburg. By delivering the quick responsive service for which we are renowned and showing to our German clients the way ClassNK always puts its customers first, ClassNK's share in the German market rapidly increased from slightly less than 2% to about 8% between 2011 and 2016, which meant

that we became one of the major groups here. It makes me proud that German clients value ClassNK's level of service highly and that we have been able to grow their number.

How would you say the ClassNK Hamburg office is different from other overseas ClassNK operations?

The Hamburg office is located in the major shipping nation of Germany and looks after the needs of the local shipping companies. In contrast to other major shipping nations like Japan and Greece, ClassNK does not yet have a substantial presence in Germany and is still in the development stage. I believe these circumstances make the Hamburg office unique and the most exciting ClassNK office in the world.

The Hamburg Office also manages a higher percentage of marine material & component surveys in Germany than other ClassNK offices outside the Asian shipbuilding

nations. This is evidence of Germany's advanced scientific and technological capabilities, as one would expect of the nation that gave us diesel. I believe this high capability and background for science and technology is one of the main factors supporting Germany's maritime industry.

How would you say the opportunities and challenges differ for ClassNK's Hamburg office today, compared to when you first arrived in 2011? What changes have there been in the responsibilities given to the Hamburg office since 2011?

As previously mentioned, ClassNK's share in the German market was slightly under 2% in 2011 but reached almost 8% by 2016. Compared to 2011, ClassNK has become better known among German shipping companies. However, there is still a lot of room for improvement in its presence, so it is essential for us to continue providing service of the best possible quality.

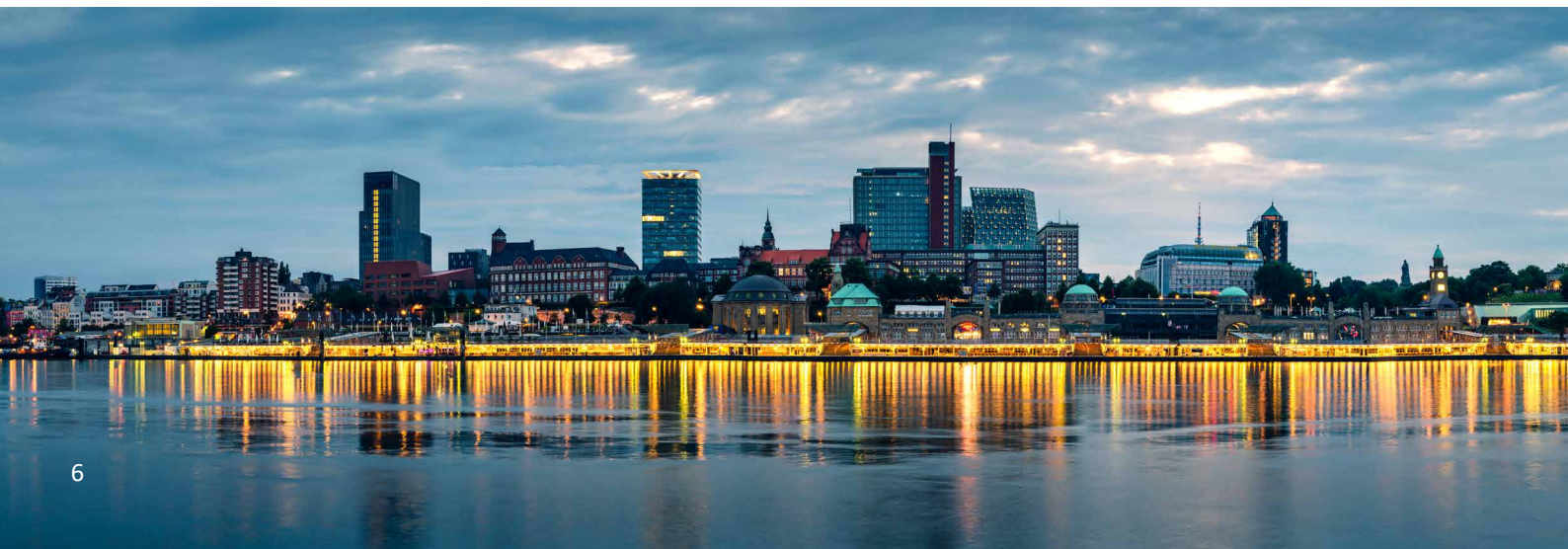
In addition to your new appointment, you are celebrating 30 years with ClassNK in 2018. Your first post involved plan approvals and field surveys. Can you give us an idea of lessons and approaches that you learned then which you still use in your job today? How would you say plan approvals and field surveys done today compare with your early experience?

Joining ClassNK in 1988, my first senior role involved being put in charge of plan approvals in the hull department. In 1993 I became involved with ship surveys at our Onomichi branch in Hiroshima, Japan. At that time, there were still a number of docking surveys in Japan for ships between 15 and 20 years old. I learned during that time that the decisions of one surveyor had a great amount of influence on client budgets and dry dock construction periods. It goes without saying that protecting life and the safety of ships at sea is ClassNK's duty. However, I also learned that it is important to



*Mr. Miura, General Manager,
ClassNK Hamburg office*

*I believe this high capability
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factors supporting Germany's
maritime industry*



fulfil survey needs and offer appropriate repair advice while making sure that the circumstances of the clients are respected. Since that time, globalization among ClassNK clients has been advancing more and more. Nevertheless, the lessons I learned when I was young established my principles and I strongly believe that we will continue being highly valued for always respecting the position of our clients.

You also gained experience in the ClassNK Istanbul office 1999-2001. What are your memories of that period, and how have you applied that experience in your subsequent career?

I took up my position in Istanbul in 1999. My boss was Mr. Hirofumi Takano, currently serving as Senior Corporate Officer and Director of the Innovation Development Division. The shipping industry in Turkey was showing signs of further growth and ClassNK's relationships began strengthening with Turkish shipping companies, especially those who were buying second-hand handy bulkers.

I had a number of opportunities to carry out special surveys for relatively aged ships ranging from 20 to 25 years old and sometimes even over 30. There was a big earthquake in Turkey in August of 1999; I still feel sorry for victims. At the time, I was in charge of three ships and even on the day after the quake I visited Tuzla where many repair docks were located. The ships floating alongside the dock were safe

from harm, but the area suffered more damage than Istanbul did. The captains were surprised that I came to visit and warmly welcomed me. Supporting Mr. Takano, I also handled business talks with the local shipping companies. Unlike Japan where ClassNK has deep roots, in Turkey ClassNK was just one of several classification societies. Instead of only requesting compliance to requirements, I tried to get clients to understand them. For that reason, I made sure to talk to customers in terms used commonly on their side, rather than using terms only familiar to us. I believe this experience has aided me with my later positions in the survey department and in Hamburg.

You also have vast experience in ClassNK's Survey Department at Head Office. What would you identify as the most challenging or satisfying project in your working life? Why?

I returned to Japan from Turkey in July 2001 and was placed in charge of bulk carrier safety upon taking up my role in the survey department. At first there were stability and strength requirements against flooding of the foremost cargo holds of existing bulk carriers. Then, the so called IACS eight package of requirements like reinforced hold frames, reinforced cargo hatch covers, and installation of water level detection equipment in cargo holds was proposed, while at the same time discussions were going on at the IMO. I think many bulk carrier owners felt the situation was com-

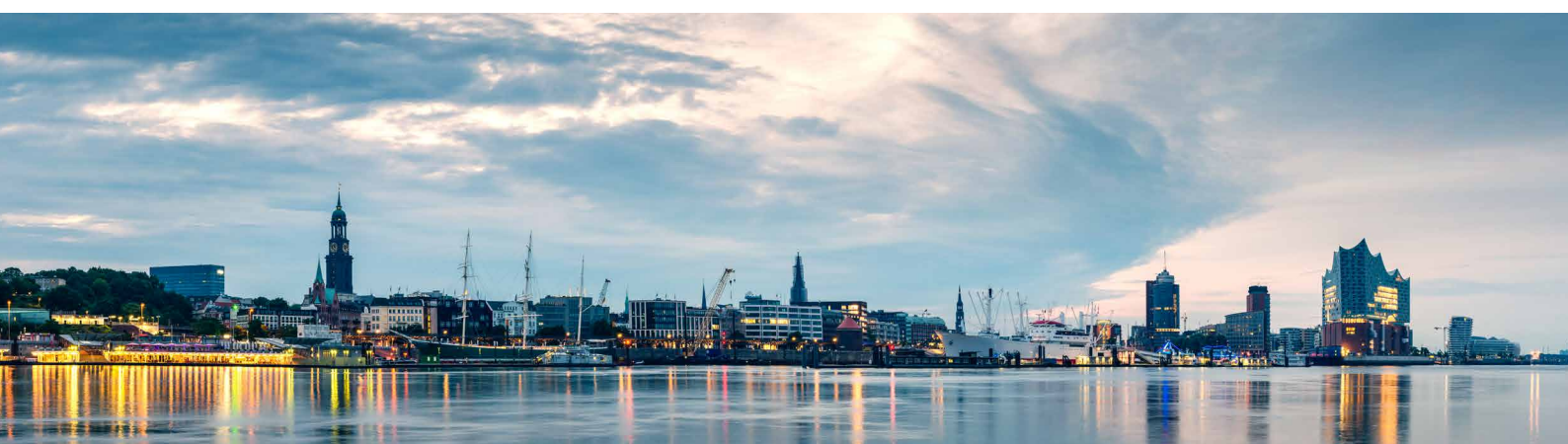
plicated and were unsure of what they should do.

I led ClassNK in providing shipping companies with the guidance to help them grasp the whole picture of the requirements and in conveying appropriate instructions to field surveyors. Our efforts in response to bulk carrier safety issues resulted in the overcoming of difficult challenges at the time and I believe they helped reinforce ClassNK's firm presence with bulk carriers.

Shipping continuously faces safety, environmental and security challenges.

What do you find most challenging in the near future of the industry?

The response to the 2020 SOx regulations is the topic of main concern among our clients. The industry does not seem to be sure which measures to take to comply, as potential options include the use of compliant fuel oil, scrubbers, or alternative fuels such as LNG. Heavy fuel oil used by ships is made from residue produced through refined gasoline. If vessels stop using heavy fuel oil, the production of many refined petroleum products may also be affected and pose a threat not limited to the shipping industry. The supply of complaint oil is another challenge, as sufficient information is not currently available. Clients are also worried about the cost sharing of SOx regulation compliance. As a classification society, we must be ready to provide support no matter which direction the industry chooses.



Survey drones take off

ClassNK carries out detailed drone tests to revolutionize ship surveying

In spring this year, ClassNK introduced guidelines on the use of drones in class surveys, covering procedures and technical considerations for safe operation, as well as requirements for drone service suppliers.*

Drones – a generic term covering unmanned vehicles of all kinds – have a surprisingly long history. In air-borne applications, their beginnings can be traced back to World War II, and specifically to the BQ-7, a modified version of US Air Force’s B-17 bomber. One of the first industrial applications was a helicopter for spraying agriculture chemicals built by Japan’s Yamaha Motor Co in the late 1980s.

The development of compact quadcopters – small devices distinguished by four propellers at each corner for enhanced maneuverability and stability – marked the arrival of modern day drones. Quadcopters eliminate the need for the complex system controlling rotor pitch found in conventional helicopters. Instead, hovering and movement can be controlled by electronically adjusting the rotation speed of individual rotors. Attitude control and maneuvering is more straightforward thanks to a dedicated flight controller and various sensors (accelerometer, GPS, air pressure and gyro sensors), which continuously send instructions to each of the rotors to ensure stability. Their small size, ease of flight and declining component costs mean contempo-

rary drones are substantially cheaper than predecessor technologies.

Although drones with multiple propellers on the same plane are currently the most widespread design, research is taking place into alternative arrangements with tilt rotors and propellers in a tetrahedral configuration. Meanwhile, significant progress has been seen in autonomous operations using higher precision positioning, and considerable advances in machine image recognition and processing.

Typically equipped with a compact camera for photography or recording video and Wi-Fi for data transmission, these easy-to-control, lightweight machines have rapidly grown in popularity. Apart from the consumer hobbyist market, and use for product delivery by online retailers, drones have attracted interest from across in-

dustry: they are ideal for collecting images from high or otherwise inaccessible or dangerous locations. They can be utilized for a range of aerial photography, inspections and surveying, and security applications, and have proved invaluable in planning rescues and emergency response.

In the maritime industry, efforts are underway to use drones for inspections and surveys. In fact, discussions on Remote Inspection Techniques (RIT) are already well-advanced at the International Association of Classification Societies (IACS), which published revised guidelines on remote inspection techniques in June 2016. The revisions of the associated IACS Unified Requirements are complete and will take effect in January 2019.

Deploying drones on ships presents some significant challenges. The

*ClassNK designated
'survey technology innovation'
as one of four focus areas listed in
its new R&D Roadmap, with drones
identified as a key technology*





drone may not function properly in the cargo hold or ballast tank due to being in an enclosed space surrounded by magnetic material which may interfere with some of its sensors – particularly GPS and magnetic compass – that are tightly linked to flight stability. Dark environments can also make it difficult for operators to fly drones safely.

Last September, ClassNK designated ‘survey technology innovation’ as one of four focus areas listed in its new R&D Roadmap, with drones identified as a key technology. The society has been verifying drone performance, with test flights conducted in a variety of enclosed spaces of the sort found on ships.

Assessing basic performance

A basic performance verification test was devised to demonstrate maneuvering (take-off and landing, forward/reverse and lateral flight, reverse flight with 180-degree yaw) and to assess the capabilities of camera and sensors. The camera performance was tested with a Landolt ring chart – the kind of chart opticians use to test eyes – to evaluate definition of different line thicknesses from 0.1mm to 5mm, and a QR code. Differences in results were observed when the subject drone, a Phantom 3 Stand-

ard from DJI, was operating with and without GPS signal. Maneuverability tests in the vicinity of a powered-off crane to assess antimagnetic performance were also carried out.

The outdoor maneuvering test took place in windy conditions, which significantly influenced the results. While fixed-point hovering was easier when using GPS, the gain was large causing the drone to over-compensate in its movements. In non-GPS mode, the gain was small and smooth maneuvering was possible, but wind-thrust had a more marked effect on the drone.

In GPS mode, the drone immediately begins hovering when the operator removes his finger from the controller, whereas in non-GPS mode, inertial force continues to move it until a counter input is given. Consequently, non-GPS mode gives a manual feel to maneuvering and it is possible that operators will find the drone easier to control. When the wind subsided in the trial, stable flight was possible regardless of GPS availability.

Indoors with no wind, stable flight was possible both with and without GPS. Since these results were obtained with a low-cost drone, it is conceivable that higher-end drones equipped with ultrasonic sensors

and other advanced features will be even more stable.

Many images photographed with the camera were extremely clear. However, because this model lacked an optical zoom, enlarged images were often indistinct. Image sharpness distinctly improved when the drone was flown closer in to its target. In survey applications, optical zoom would be an essential requirement. Camera specification and artificial lighting will also need to be considered if photography in dark environments is deemed necessary.

The tests in the material storage yard with a crane threw up some interesting results. The drone initially failed to take-off, with the system displaying a ‘compass abnormality’ error message. However, when launched from a more magnetically benign location, the drone was able to approach the crane without the issue. This suggests performance in the presence of magnetic structures must be carefully evaluated before a drone is deployed to carry out inspection work.

Tests in simulated tanks

To simulate conditions inside a ship’s tank, a drone was put through its paces in a land-based, steel test tower. The experiments, using a DJI Matrice100 drone, studied the impact on performance due to compass unreliability, intermittent or complete lack of GPS and poor lighting both for flight control and photography.

Take-off was possible when the drone was placed more than 50cm away from magnetic materials, i.e. the steel walls. There was no difference in attaining stable flight between GPS and non-GPS mode, revealing that drones are operable with only basic inputs from gyro and accelerometer. Piloting a drone that has relatively low control precision

The society will continue to actively work with innovative technologies like drones and will continue to make efforts to contribute to the further development of the maritime industry



is a good way for operators to accumulate experience.

When flying near walls, there was a slight shaking in the drone motion, owing to the wind from the drone's own propellers. To prevent collision with walls, it may be necessary to attach a guard or collision prevention device.

Images taken inside the tower were generally of low quality, due to a combination of poor light conditions, small camera sensor size, and

inappropriate ISO settings. Artificial light sources, both from ground level and mounted on the drone itself, resulted in improved images. When the photo subject contains highly polished or metallic surfaces, it will be necessary to experiment with different arrangements in order to produce diffused light that minimizes reflection. Night-vision cameras may also be considered as an option. It was also noted that videos transmitted from the camera were frequently corrupt on the receiving terminal such as a smartphone.

Tests onboard ships

The final phase of the study was directed at testing the performance of drones inside a cargo hold of a bulk carrier and tank of an oil tanker and was carried out with the cooperation of Kanda Shipbuilding and Orient Marine in the first instance and Tsuneishi Shipbuilding and Technos Mihara in the second. Drones used were the 4.5kg DJI Matrice 210 and the 3.5kg DJI Matrice 100.

On the bulk carrier, the trial took place with the hatch half open, providing an intermittent GPS signal and good daylight for photography, so additional lighting was not required. The flight route was based on the path of an actual internal audit. Because the Matrice 210 is an industrial grade drone with sophisticated machine-vision based self-localization, its flight was stable regardless of GPS availability.

Photography was carried out at a distance of 5m, as the drone itself is almost 1m wide. The high-quality camera benefited from both optical and digital zoom. Zoom photography is generally sensitive to vibra-



tion or movement, but good results were obtained thanks to the drone's high stability when hovering at a fixed point.

However, at higher altitudes the downward facing vision system found it harder to capture landmarks on the hold's uniform ground surface. This inhibited the self-stabilization, especially when GPS was unavailable. In such conditions, manual flight by the operator is preferable.

At one point during the trials both GPS and the vision system did not function at the instant that a compass error occurred. Although the drone drifted, the operator, who had more than 500 hours flight experience responded calmly and kept the flight stable. The exercise demonstrated that safe flight in a hold is possible but highlights the importance of having a skilled operator and choosing a drone with high redundancy for magnetic materials. Furthermore, as the size of Matrice 210 prohibited flight in close prox-

imity to members, there will inevitably be blind spots in surveys with this type of drone.

On the oil tanker, as with the bulk carrier, the flight path was selected according to locations for photography needed in an actual close-up survey. The pilot worked together with an assistant in charge of the camera. A third surveyor checked the images as they came in, requested close-ups when needed, and signaled when to move to the next location. Additional illumination was provided by lights mounted on the drone. This configuration delivered good results for still images but video images suffered from noise.

Fixed-point hovering was difficult because flight was performed in non-GPS mode. The resulting movement caused blurring in photos of members and made pinpoint checks somewhat stressful. This degradation in image quality was exacerbated in zoom photography. During close-up photography, re-

sults were heavily dependent on the operational skill of the drone pilot, especially when flying close to walls or other structures. The pilots in these tests had at least 100 flying hours experience.

Compass error occurred and prevented take-off when attempting to fly the Matrice 100 after an extended period of time. Although it is hard to draw definitive conclusions about the effect of magnetic materials, it is thought that the accumulation of error due to the presence of magnetic materials was a factor.

The procedures and best practice given in ClassNK's guidelines combine the understanding of drone performance gained in these and other trials with its decades of experience conducting class surveys. The society will continue to actively work with innovative technologies like drones and will continue to make efforts to contribute to the further development of the maritime industry.

** The guidelines are available for free download from www.classnk.com for those who have registered for the ClassNK MyPage service.*

Preparing for a more automated world

ClassNK has developed guidelines to help owners assess the risks of greater automation

Artificial intelligence (AI), IoT systems and sensors have developed rapidly in recent years and the convergence of these technologies has heralded a new era of innovation across a range of fields.

Progress has been particularly fast in transport, where guidance technology has become part of everyday operations. 'Fly-by-wire' is the term used to describe planes that virtually fly themselves, with pilots taking a supervisory role. The automotive sector has also been a keen early adopter, with cruise control, intelligent brake assist and, more recently, automated lane keeping becoming standard options on many production vehicles. The car industry is now ploughing large sums into the development of self-driving technologies, with trials currently taking place around the world.

If and when self-driving vehicles take to the open road, their operation is expected to help reduce accidents and spur the development of new ownership models and solutions for easing congestion. It's also important to remember self-driving is not limited to private passenger cars; the technology would revolutionize haulage and distribution and have an immense impact on supply-chain efficiency.

Therefore, the maritime industry too is excited by the possibilities of greater automation and even the

The development of autonomous technology for ships is likely to proceed in many different directions and take on many forms

prospect of autonomous 'self-piloting' ships. Numerous R&D projects are underway exploring how AI might be exploited to improve operational efficiency, reduce the cognitive burden on crew and improve safety by preventing human error.

The development of autonomous technology for ships is likely to proceed in many different directions and take on many forms. These can be broadly divided into: 1) development of relatively small vessel types that aim for full unmanned operations, such as commuter ferries sailing back and forth on a fixed itinerary in sheltered waters; and 2) the development of systems for partially automating tasks onboard with the objective of supporting the crew in their work, which seems a more likely path for SOLAS ships in the wider commercial fleet.

Assuming development continues along these diverging trajectories, it

is unlikely a set of uniform prescriptive requirements will ever be defined. Thus, from a safety perspective, it will be necessary to clearly identify and understand exactly the scope of the automated solution so that there is no ambiguity as to where the machine's role ends, and the crew member's role begins. Clarifying this relationship and the extent to which responsibility is shared will be critical to successful implementation. Furthermore, it is important that all stakeholders involved - including class - have a common understanding of this relationship and its impact on vessel design and operation.

To make it easier to reach this common understanding, ClassNK has compiled a set of guidelines explaining the requirements that must be considered from the perspective of ensuring safety in the design of automated and autonomous systems. They specifically cater for



systems that involve human-like decision-making behavior, i.e. recognition, decision, response.

Accommodating a rapidly changing landscape and the fluidity of automation and autonomy has been a major challenge. ClassNK's approach was to devise a philosophy based on functions, tasks and sub-tasks. A ship can be considered as a single plant, whose operation depends on a number of functions, such as navigation/ship handling, propulsion, power management, cargo management. These functions can be broken down into smaller jobs or 'tasks'. Thus, automation refers to using a computer system to carry out partly, or as a whole, a task normally carried out by a crew.

However, many tasks are too broad or complex to be automated in their entirety. For this reason, they are split into sub-tasks. For example, the task of navigation would include sub-tasks, such as watch-keeping. The benefit of this approach is that tasks can continue to be broken down into ever smaller parts until the scope of automation can be defined in clear, non-ambiguous terms.

Other important notions are domains and fallback. A domain specifies the conditions and environment under which automation is expected to function. This could be geographical, related to prevailing weather or sea-state, or any other parameter acting as a threshold on the capabilities of the automated solution.

Fallback describes what steps are taken or what safeguards are in place to minimize risk if or when the automated system drops out from its domain or otherwise malfunctions, for instance, due to a cyber-attack.

Using these concepts, a hierarchy of autonomy can be built:

0th) Human carries out all decision-making and tasks;

1st) in specific domains, automated system carries out some decision-making in sub-tasks, while the human operator handles the rest. In fallback scenarios, the human operator takes full responsibility;

2nd) in specific domains, an automated system carries out all decision-making in sub-tasks. In fallback scenarios, the human operator takes full responsibility;

3rd) in specific domains, an automated system carries out all decision-making in sub-tasks. In fallback scenarios, another computer takes control.

The fourth and final level takes us to full autonomy, where decision-making for all sub-tasks in all domains is carried out by machine. Fallback scenarios are also handled by computer and there is no human involvement. Because this hierarchy applies to the tasks that comprise each function, it is possible for different levels of autonomy to exist on a ship at the same time.

When performing a risk assessment of an automated system, the Guidelines list several practical factors that should be taken into consideration. These include the possibility of errors caused by poorly designed human-machine interfaces; the impact of automation on tasks which are not automated and overall vessel functionality; the limitations of any communications infrastructure; the resilience of computing hardware and related sub-systems; discrepan-

cies in sensors; and attacks by malicious parties (whether technological: cyber-risk, or physical: pirates).

It is particularly important to consider and establish procedures for handling the transition between human and machine control so that there are no impacts on safety. This process should include the time needed and steps/instructions to ensure the human operator is ready and prepared to take control from the machine. Procedures and workflows related to other non-automated tasks may also need to be updated to take account of newly introduced automation.

If remote control forms part of an automated solution, attention must be paid to any circumstances or factors that would threaten the availability or limit the effectiveness of the remote operations center as well as minimum communications requirements, particularly when setting the domain. Furthermore, sub-tasks affecting vessel operation may be performed by a machine or human operator not present onboard. In either case, it is still necessary to describe how tasks are allocated and where responsibility lies.

The maritime industry has only just begun to explore the possibilities of automation, which makes it difficult to predict how it will be implemented on ships. Moreover, the underlying technologies are evolving at a rapid rate. The new guidelines represent a significant first step in getting to grips with and accommodating these developments in a maritime context. ClassNK will continue to pay close attention to advances as they unfold and may update these guidelines in order to ensure the safety of vessels and their crew.





Aligned with Orion

Leading German client Orion Reederei offers insights into its close relationship with ClassNK

Led by Johann-Stephan Reith, Orion Reederei has been quietly expanding its horizons in recent times. The company, which is one of Germany's most distinguished shipping organizations specialized in bulk carriers has been using its extensive knowledge to "take on the management of ships from good friends", according to Mr. Reith.

In doing so, he emphasizes that Orion makes no distinction between the ships it owns and those it manages when it comes to the standards it insists on. Often, the company has a minority share in the ships it manages anyway, he says, but there are straightforward imperatives that mean "all ships are always treated equally" from the technical management point of view.

"If you start treating ships in the fleet differently, you are bound to fail in our opinion," says Mr. Reith. "Which captain wants to go on the ship that is being taken care of with less attention? Which superintendent would like to be in charge of a ship that has no budget or where there is a 'lower maintenance' standard strategy in place in order to save cost? We do not think that such a strategy can work."

In addition, the individual ship must be considered as a unified whole, where all equipment is in working order. "We are not satisfied until ALL - really all - equipment is working satisfactorily. All of us, whether in the office or onboard, know that everybody in Orion can only live well if the ships are performing

at 100% at all times, so that is the target. We consider those working ashore as the support organization for the crew onboard and for the ship. This drives the attention to details that we emphasize."

Supporting these endeavors has been ClassNK, which has counted Orion among its customers since 1984. Today Orion Reederei has placed all of the 30 ships in which it has a management interest with the Japanese society.

Mr. Reith says that the good cooperation enjoyed between Orion, ClassNK's Tokyo Head Office and its various local bureaus, "and especially and naturally with the Hamburg office", point towards the relationship continuing to last.

“During the last 20 years we have processed an array of newbuildings in different sizes and for different purposes worldwide, and about 80% have been under supervision and in cooperation with ClassNK. The hallmarks of the resulting teamwork have been seen in top-quality project review, high flexibility and detailed knowledge, as well as consideration of our demands as owners. These experiences provide clear reasons to choose ClassNK for any further newbuilding projects.”

The enduring relationship has developed for other reasons, Mr. Reith adds. “As an example, in 2011 ClassNK decided to strengthen the local office in Hamburg, sending Japanese representatives as local decision-makers. For us it was another sign that we are working with a strong institution which can invest and support important changes - one which understood the importance of fast professional decision-making and the necessity of being close to the customer, taking the pulse of everyday business life and being responsive to change. This is what owners and managers need!

“This decision gave us the confidence that we were investing in a durable and professional relationship with a partner ready to feedback with solid support and permanent care, which was also open to further sustainable development.”

Recent years have seen ClassNK response times improve noticeably, Mr. Reith says. “Not only the time, but also the fact that the next message after a reported problem is a solution. The distance from reporting a ‘need’ and having the right decision, is very short.”

Close cooperation between owners and class will be critical to meet certain of shipping’s common challenges, Mr. Reith is convinced. “The shipping industry is overflowing with new rules and regulations from numerous authorities; these are sometimes contradictory in regard to content, technically not feasible, and allow room for different interpretations.

“In part, we see class societies as the technical representatives of owners and managers on the lobbying stage. Where international politics are deciding the future of the shipping industry, the industry needs strong technical representation at the table to ensure that what is decided is also practicable. On a smaller scale, we would like classification societies to focus on their response time to regulatory changes.”

Also providing a challenge is digitalization, where shipping’s main stakeholders must work collaboratively to reap rewards that extend along

the supply chain but also penetrate every aspect of a diffuse industry.

“The ongoing quality-increase of service and maintenance processes, of safety-related procedures onboard and the optimization of onshore support for our vessels require deeper levels of digitalization,” says Mr. Reith. “The national and international terms and regulations arising out of this trend can only be implemented in a close cooperation between ClassNK and vessel owners. In the future this will be reflected in an increase of the support for the owners by ClassNK, especially when it is coming to digitalization issues.”

It is a cooperation based on mutual benefits, Mr. Reith observes: “It is the enormous resource and power of knowledge accumulated over so many years, and the daily experience with more than 9,100 ships which makes us bring ships to ClassNK when we can. ClassNK is always interested in finding solutions and not making small problems into bigger ones!

“Furthermore, we think ClassNK has avoided the turn to profit-only orientation (which a number of other classes have made). We feel that restraint from following that trend has protected the ‘old’ winning spirit of ClassNK.”

It is the enormous resource and power of knowledge accumulated over so many years, and the daily experience with more than 9,100 ships which makes us bring ships to ClassNK when we can



In safe hands with Jüngerhans

Q&A with well-known German shipowner Herm Jüngerhans, of Reederei Jüngerhans



Please indicate the number of ships currently under Reederei Jüngerhans ownership/management, including the share of your fleet contributed by different ship types.

We operate a modern fleet of 40 ships, about half of which are container feeder and half are heavy-lift vessels. The container vessels are all in the size class of around 1,000 TEU, while the heavy-lift vessels have a loading capacity of between 8,000 to 14,300 DWT and a combined crane capacity of between 400 to 800 tons SWL.

As you specialize in heavy lift vessels as well as container carriers, what technical capability is necessary for handling heavy lift cargo?

Our focus, first of all, is on the technical performance of the vessels, especially that of the cranes on board. In addition, we prioritize the performance of other technical equipment on board and on vessel flexibility, e.g. utilization of tween-decks or solutions for deck cargo are areas of close attention. A well-trained and well-rehearsed crew on board is paramount, which is why we attach great importance to

sound education and training. This is a continuous process which we are busy improving all the time.

How has this changed over the last five years and why?

The requirements of cargo customers are becoming more demanding. Handling when loading and unloading as well as lashing is of immense importance, especially with large-format and heavy cargo elements. We benefit very much from many of our crew members having sailed on our vessels for years, even decades. Drawing on this pool of knowledge



For future challenges like digitalization and Big Data I am confident that ClassNK will share their expertise and assistance on a high-quality level

allows us to influence the training of our heavy-lift experts so that they can develop their own abilities on board as part of experienced teams.

In general terms, what are your current plans with respect to building new ships, acquisition or disposal, and scrapping? What is the business outlook/financing landscape on which you base these plans?

In the last two years, we have concentrated on newbuildings and the purchase of container vessels, as we have considered the economic conditions to be more favorable there than in the heavy-lift market. However, we are very optimistic that we will be able to invest in the heavy-lift sector within the next 12 months.

What is the nature of your relationship with ClassNK? Which vessels are involved and which services are provided?

We have almost our entire heavy-lift fleet with ClassNK and use the “full package”, i.e. the entire ClassNK service range.

Are your requirements when it comes to ship inspections changing, and in what way? How has, or can, ClassNK assist you in managing these changes?

Yes, indeed! We have implemented several procedures and checklists to prepare our fleet for any kind of inspection. We have an additional focus on preventive measures for recurrence of all kind of deficiencies and observations. The monthly PSC information and PSC Bulletin from ClassNK is very useful and will be applicable.

What do you consider your main challenges to be in terms of retrofitting your existing ships with equipment required to meet new regulations, including rules permissible emissions and fuel use, fuel monitoring, ballast water management or antifouling coatings?

Due to the special regulations in the SECA areas, the issue of “exhaust after-treatment” will remain on the agenda. Retrofitting existing tonnage, however, will always be judged from an economic perspective. This, in turn, is significantly linked to the development of crude oil and hence bunker prices.

Regarding ballast water treatment systems (BWTS), we expect further technical solutions to be launched in the market in the near future.

In our view, these two issues will be the key challenges for the near future.

How are classification societies helping you to meet these requirements and do you seek more assistance on specific topics and why?

In daily operations classification societies are of great help to us in being responsive very quickly on a high-quality level, especially if we are facing challenges from emergencies or Port State Control, for example. This definitely is the case in our co-operation with ClassNK.

For future challenges like digitalization and Big Data I am confident that ClassNK will share their expertise and assistance on a high-quality level.

What projects or plans do you have to extend your use of connectivity, digital technologies, big data analytics, the Internet of Things, remote diagnostics, cyber security, etc.? In your view, how have or can classification societies help you with these initiatives?

We are in the process of implementing procedures to fulfil all requirements in due time. We are always interested in obtaining some good suggestions from our class society partners on this topic.



A sanctuary in the metropolis

A visit to the Meiji Shrine uncovers one of Tokyo's tranquil hidden gems



Lying conveniently next to the train station in Harajuku, one of the many popular Yamanote line districts in Tokyo is Meiji Shrine (Meiji-jingu), a tranquil and historical site that allows the visitor to get away temporarily from Tokyo's urban atmosphere. This shrine was built in 1920 to commemorate Emperor Meiji, Modern Japan's first Emperor, and Empress Shoken who passed away in 1912 and 1914 respectively. A long path with multiple routes stretches from two light-brown, 12-meter torii gates at the entrance to the inner shrine itself, making it a pleasant place for walks. Over 100,000 planted cedar trees which were donated during the construction of the shrine adorn the grounds, providing a shady and comforting forest environment, especially in the summer.

Upon visiting Meiji Shrine, there are a variety of activities to engage in regardless of the time of the year. A visit usually consists of purifying the hands with water, tossing a 5 yen coin (pronounced "go-en" in Japanese, which also means "good fortune") into the offering box, and then bow-



ing and clapping to make an offering. The visitor can also write a wish onto a small wooden tablet and hang it on a wooden wall containing other visitors' written wishes. In addition to visiting the shrine to pray and make offerings, many people hold traditional weddings onsite year-round. In these traditional Japanese weddings, the bride wears a white, silk gown with a hood, and the groom wears a traditional black and grey kimono.

The historical importance of Meiji Shrine can truly be felt by visiting the treasure house and museum located within the grounds. They both contain historic artifacts from the Meiji era, including possessions of the Emperor

and the famous carriage which he rode to the 1889 Meiji constitution declaration. There is also a garden displaying a colorful variety of flowers at Meiji Shrine which is said to have been regularly visited by the Royal family in its early days. It is now considered to be a spiritual "power spot".

New Year's Day in Japan is when Meiji Shrine attracts the most visitors, as Japanese people are accustomed to visiting a shrine to start off the year. Other popular occasions for visiting Meiji Shrine include the spring and fall festivals and national holidays. No matter what the occasion, Meiji Shrine offers a worthwhile experience to enhance your journey in Tokyo.

ClassNK events:

- ◆ **SMM, HAMBURG, GERMANY, 4TH - 7TH SEPTEMBER**
Please visit ClassNK at stand B2.EG.212
- ◆ **GASTECH, BARCELONA, SPAIN, 17TH-20TH SEPTEMBER**
Please visit ClassNK at stand A235
- ◆ **SHIPTEC CHINA, DALIAN, CHINA, 24TH-26TH OCTOBER**
Please visit ClassNK at stand 2F06
- ◆ **SEATRADE MIDDLE EAST MARITIME, DUBAI, UAE, 29TH-31ST OCTOBER**

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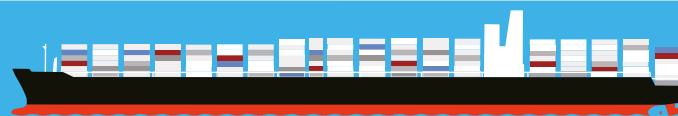
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