

N-2253.5

UNCLASSIFIED

2253.5

Amphibian trucks in the ETO, by Lt Col F.  
G. H. Smith. Command and Staff College.  
1946-47.

**This Document**

IS A HOLDING OF THE

**ARCHIVES SECTION**

LIBRARY SERVICES

FORT LEAVENWORTH, KANSAS

DOCUMENT NO. N-2253.5 COPY NO. 1

CGSC Form 160  
13 Mar 51

Army—CGSC—P2-1798—7 Mar 52—5M

N-2253.5

UNCLASSIFIED

58-392

Incl 1



**UNCLASSIFIED**

COMMAND AND STAFF COLLEGE  
FORT LEAVENWORTH  
KANSAS

School of Combined Arms  
Regular Course  
1946-1947

Amphibian Trucks in the ETO

Lt.Col.F.G.H.Smith

~~RETURN TO  
PAPER SECTION  
LIBRARY C&S~~

**UNCLASSIFIED**



UNCLASSIFIED

Table of Contents

Index	1
Bibliography	2
Introduction	3
Development of the Amphibian Truck	4
Amphibian Trucks in the ETO	6
Conclusions	16

UNCLASSIFIED

UNCLASSIFIED

Bibliography

1. Army Ordnance - Vol.25 - July-December 1943
2. USFET General Board - Vol.XXII
3. R-2740 - Shore Engineers in Sicily
4. R-2078-1 - Report of Quartermaster Activities in Sicily
5. S-2765 - Working of Sicilian Beaches
6. R-4477 - The DUKW, Operation and Uses
7. R-5461-10 - Operation Report Neptune
8. S-6990 - Amphibious Operations, August to December 1943
9. S-3934 - Handling Supplies Across Beaches

UNCLASSIFIED

UNCLASSIFIED

INTRODUCTION

The purpose of this monograph is to illustrate, so far as possible in the limited time available, a few of the ways in which two and one half ton amphibian trucks (better known as DUKWS) may be successfully employed and some of the problems encountered in their operation and maintenance in the ETO which effected their efficiency with the hope that this information may be of some value to you as commanders and staff officers in making the best possible use of this particular vehicle.

UNCLASSIFIED

## Development of the Amphibian Truck

I would like to discuss briefly the development of the amphibian truck.

Records indicate that subsequent to 1920 some Army personnel foresaw the necessity for an amphibian vehicle in future operations and had given considerable thought to "amphibianizing" conventional vehicular equipment. Prior to 1940, however, the theory was generally held to be a "crackpot" idea.

Early attempts at making vehicles amphibious centered largely around the idea of providing detachable flotation gear and using an outboard motor as a means of propulsion.

The first definitely expressed requirement for an amphibious vehicle in the United States Army was formally presented when the military characteristics for the  $\frac{1}{2}$  ton, 4x4 truck were drawn up on 27 June, 1940. These military characteristics specified that the vehicle was to be amphibious, if practicable. These amphibious characteristics were not incorporated into the "Jeep" specifications as it was not considered possible of accomplishment at the time without a complete redesigning of the body and the chassis.

On 15 April 1942 the Quartermaster Corps was authorized by the War Department to pursue the development of an amphibian truck based on the use of the standard  $2\frac{1}{2}$  ton, 6x6 truck and its components. The research on this vehicle was turned over by the Quartermaster Corps to the National Defense Research Council. A development contract was signed with the Yellow Truck and Coach Division of General Motors Corporation, 15 April, 1942 and forty three days later the first pilot model was demonstrated to the Quartermaster Motor Transport Subcommittee. This pilot model was basically the DUKW as we know it to-day except for the tires. The original pilot model was equipped with standard 7:50x20 truck tires. These tires did not have sufficient flotation for use on sand and the vehicle when thus equipped had no advantage to offer over the standard truck when operating on a beach. The pilot model was further tested at Fort Belvoir and was then driven to Fort Story for testing in heavy surf. The vehicle stayed at Fort Story for some time but due to continuing light surf conditions no conclusive tests could be conducted. Finally HQ ASF, feeling that preliminary tests had indicated the value of the vehicle to the Army, directed the purchase of several hundred DUKWS incorporating certain recommended changes such as the use 11:00x18 desert type tires and a self contained air compressor. Retooling of factories and the introduction of some major and many minor changes in the specifications delayed the production and issue of this vehicle in time



for it to be used in the invasion of North Africa.

## Amphibian Trucks in the ETO

The landings in North Africa in November 1942 demonstrated the vital need for an amphibious vehicle with a reasonably large cargo capacity. During landing operations the landing craft engaged in ship to shore operations frequently grounded down on what appeared to be the beach but which in reality were offshore sandbars and as a result some men and a considerable amount of supplies and equipment were lost when they fell into deepwater runnels. A considerable number of landing craft were either lost or damaged when they broached in the surf while landing or being unloaded. Furthermore, supplies and equipment carried in landing craft had to be manhandled at the waterline and since there was a serious shortage of both men and land transportation these supplies were concentrated in large dumps dangerously close to the beach and so located as to offer little or no protection from either the elements or the enemy. The few available standard trucks were unsatisfactory when used to unload supplies directly from landing craft since they bogged down in the soft beach sand. As a result of these experiences a recommendation was made to the War Department that, in the future, forces making large scale amphibious landings be equipped with some type of amphibious vehicle capable of continuous ship to shore unloading operations. This recommendation apparently focused attention on the production of the DUKW.

Early in the spring of 1943 the first amphibious vehicles were received in the theater and were assigned to the 361st QM Amphibious Bn, a unit of the 1st Engineer Special Brigade. This battalion was given the mission of learning to operate and maintain these various types of vehicles with the least practicable delay. This unit had neither seen nor heard of these vehicles before and the fact that only one copy of the operating and maintenance instructions for each type of vehicle was made available added to the other training problems.

The  $\frac{1}{4}$  ton amphibious truck was found to be unseaworthy in rough water and surf. The LVT had certain inherent mechanical deficiencies and required a great amount of maintenance after short periods of operation. For these reasons these vehicles were eliminated for employment on a large scale in future operations.

Training facilities ashore were excellent in the Arzew - Port a Poule area. Afloat they left much to be desired. All offshore movements had to be coordinated with the Navy and if such movements were outside the harbor area a Naval escort was required. Night operations were frowned upon. Cargo nets and mooring gear had

to be made by the DUKW company personnel in their spare time. Only on occasion could permission be obtained to participate in the actual unloading of ships. Captains of merchant ships complained about wasting their time by unloading their cargo into "washtubs on wheels". LST captains were reluctant at first to lower their ramps in deep water and allowing the DUKWS to practice entering and leaving the LST's at sea. Later these same LST skippers were among the DUKWS staunchest supporters.

Initially the DUKW operators themselves had been somewhat skeptical of the DUKWS ability, especially its ability to carry large drafts of cargo under adverse operating conditions. Much of this doubt was based on the fact that a DUKW has a very thin hull and has a freeboard of twenty three inches forward and eighteen inches aft. As their operating skill improved so did their confidence in the DUKW. This confidence in the DUKW was apparently not felt by higher authorities despite frequent conferences with high powered salesmen sent to the theater by the War Department with the sole mission of selling the DUKW to these people. As the DUKW companies became more skilled they started to make experiments. They found that with proper rigging a light tank could be safely floated ashore between two DUKWS providing the water was reasonably calm; that by lashing two DUKWS together abreast and decking over the cargo hatches, half tracks, small and medium sized tractors and fighter planes could easily be ferried ashore; that jeeps and 105 mm howitzers could be carried in a DUKW; and that by mounting an A frame on the stern of a DUKW that it made an excellent emergency substitute for a mobile crane. Much of the credit for the development of the method of carrying 105's in DUKWS must go to the 5th FA Bn who volunteered their guns and gun crews for the experiments. General Clift Andrus, 1st Division Artillery Officer and Col. Waters, Executive Officer, after watching a demonstration of the DUKWS carrying the 105's were highly enthusiastic and it is believed that it was their recommendation that DUKWS be used to take in light artillery with the assault echelons in amphibious operations that made the initial crack in the shell of skepticism which seemed to surround higher commanders whenever DUKWS were mentioned. At a demonstration put on by the Fifth Army Assault Training Center the DUKWS were given a prominent place but the only high ranking officer to show much interest in them was General Montgomery. A few days after this show General Patton requested that he be taken for a ride in a DUKW. The ride as a whole was rather uneventful but it wound up in a breath taking trip across some steep sand dunes on which some of the Generals proud tanks were badly bogged down. The trip left the General white faced and slightly breathless. After looking at the General the crew and other passengers were also white

faced and breathless, but the DUKW had been sold! In no uncertain words General Patton, told everyone within hearing that he wanted DUKWS, lots of DUKWS. He also ordered several new DUKWS sent to Arzew together with an equal number of SCR 399 radios which were to be installed in the DUKWS for use by his headquarters. The installation of these radios posed a great many problems but these were overcome and the test runs were successful. It is assumed that they operated satisfactorily thereafter since there were no repercussions from higher headquarters.

Once the DUKWS had been "sold" the next problem was one of obtaining and training the personnel necessary to operate and maintain them. The 361st QM Bn was given the mission of training eleven hundred troops in ten weeks. The results of this training were fairly good considering the 361st's limited experience with DUKWS, the limited facilities available, administrative difficulties and the people they were given to train. The British cadres were of better than average caliber. The QM battalions were newly formed units whose personnel had been obtained from various armored units and AAA units which had been broken up. Their morale was low and their organization and discipline were not of the best. The Engineer regiments insisted on sending their "eightballs" until the policy was adopted of returning such personnel promptly to their parent units. One Ordnance company was sent up to learn DUKW maintenance. They stayed about three days and were ordered out on some other mission. To help alleviate the driver shortage, about one hundred fifty drivers were shipped from the States as fillers. They were a fine group of youngsters and were fairly good DUKW drivers but they in turn posed another training problem. They had received no basic training and arrived completely equipped with one summer uniform, one suit of impregnated fatigues and one each cot folding.

Most of the DUKW units that were to take part in the Sicilian landings were equipped with new vehicles which were shipped by rail to the staging areas. The vehicles of the 361st QM Bn were driven overland from Arzew to Bizerte, a distance of about one thousand miles. Although these vehicles had been previously been used almost continuously for training drivers, this long trip over varied terrain and all types of roads presented no unusual maintenance problems. The hulls were not damaged and the vehicles were ready for water operation on arrival at Bizerte.

The success of the DUKW in the Sicilian campaign was phenomenal. It was used for many purposes, including some not planned for. In addition to carrying in light artillery they were used by some infantry units to land elements of

the Heavy Weapons company. During an enemy counterattack on Gela they were used to move a Ranger Bn to a beach near the port and contributed greatly to the German defeat. They were operated far inland to evacuate casualties and prisoners directly to the ships. However there were many drawbacks to successful DUKW operations. Very little weather or hydrographic information was available. DUKWS were parceled out as individual vehicles or in small groups without provision being made for their return to battalion control after the original mission had been completed and as a result some DUKWS were retained by combat units for weeks --- until they broke down or their tires wore out. Operational control of the DUKWS on the beach and at shipside originally was vested in personnel who had little or no knowledge of DUKW operations and some DUKWS were sunk due to overloading at shipside despite drivers protests. Communications between shore and ship were poor and there was delay and confusion in dispatching DUKWS to ships. There were insufficient drivers and mechanics in the companies to provide for round the clock operations nor were trained replacements replacements available for casualties losses. Tired drivers raised the accident rate and at times DUKWS had to be immobilized because of driver fatigue. Due to a shortage of standard trucks DUKWS were required to make long inland runs which reduced their efficiency in unloading ships. Lack of maintenance equipment and spare parts were serious factors. Other factors were the tendency of cargo ships to anchor to far off the beaches; unsatisfactory range light on the beaches for night operations; delays in unloading at the dumps due to lack of service personnel and cranes; difficulty in handling palletized loads; lack of road signs and military police; and the lack of an SOP for dispersal of landing craft during air raids. Despite these drawbacks the DUKWS had demonstrated their usefulness and no operation after "HUSKY" was attempted without them.

The following extracts are taken from after action reports on operation "HUSKY":

FROM THE 1ST ENGINEER SPECIAL BRIGADE REPORT

"This was the first large scale employment of DUKWS. They proved to be very sturdy vehicles that could go anywhere. They are a reliable and rapid means of getting supplies from ship to shore. The use of beach sleds for carrying shore engineer equipment and supplies met with varying degrees of success. One regiment reported very good results; another regiment had fair results; another regiment wants to burn its sleds. All regimental commanders agree that DUKWS would eliminate the sled problem. One item sadly lacking was a sufficient supply of tires

and tubes for the DUKWS. Brake fluid was another major lack. In this general connection, the equipping of shore troops was very late and never entirely or satisfactorily completed. This delay was seriously felt during the operation!

FROM BRITISH EIGHTH ARMY

" DUKWS have been an outstanding success. The greatest risk which an assaulting force runs when opposed by a determined enemy is probably that of a counter attack close to the beach before supporting arms have been taken ashore. The supporting arms for the invasion of Sicily were largely in LCT's and the wind which arose on D-1 resulted in a delay of several hours in the arrival of these craft. On many beaches there was a further delay, also of a few hours, in getting LCT's close enough to the beaches to allow of the supporting arms being unloaded, and that this type of delay is likely to occur so long as we rely mainly on LCT's for discharge of supporting arms. The obvious solution, if it can be arranged, is to swim the supporting arms ashore in DUKWS at the same time as the assaulting troops. DUKWS were actually used in swimming in a number of 105 mm guns two of which were sunk in the process through adding too much ammunition. We ought to develop more fully the Seventh Army method by which supporting arms, with initial ammunition loads, are brought ashore in DUKWS, and then unloaded by other DUKWS or by small cranes taken ashore for the purpose. In this respect the use of sixteen DUKWS by the Americans on D day to D+2 for unloading artillery up to and including 105 mm proved most successful, artillery being got ashore and ready to fire very quickly. Seventh Army found that DUKWS, dripping sea water as they leave the sea are excellent beach road preservers. Lastly, it must be emphasized that discharge rate at any beach or area is largely dependent upon numbers of small craft and especially DUKWS, available. Seventh Army had very much greater numbers of DUKWS than Eighth Army and no doubt owed much to this (each DUKW being probably worth, on average, one ton per working hour). Incidentally, the mortality among Seventh Army DUKWS was surprisingly low having only about ten out of commission out of a total of over two hundred on July 22, 1943. One got the impression that the proportion of lame DUKWS, and especially non-swimming DUKWS, was rather larger than this at some Eighth Army beaches".

In operation "Avalanche" (Salerno) much greater use was made of DUKWS for taking in artillery and anti-tank weapons. Probably due to the lack of standard trucks, a great many DUKWS were retained ashore after making their initial run in. This adversely affected the unloading of supplies on the beaches. The Navy was especially critical since they were depending heavily on the DUKWS for ship to

shore operations.

Reports indicate that the British used their DUKWS on long inland runs and encountered a great deal of trouble when the DUKWS broke down and blocked the narrow inland roads.

Minimum use was made of DUKWS in this operation. Several trained DUKW units were diverted to operating standard trucks. Some of the DUKWS were operated to a limited extent by provisional companies organized from shore engineer personnel, the balance of the DUKWS were parked and not used.

During the preliminary training for operation "SHINGLE" (Anzio) a considerable number of DUKWS and 105 mm howitzers were lost at sea. This loss was largely due to inexperienced personnel and improper operation. In the actual operation, however, the DUKWS took in the artillery without a loss. They were invaluable in this operation for in addition to their normal role of carrying cargo direct from ship to shore they were used to unload LCT's which could not be beached because of bad weather and surf conditions which prevailed. Twenty five percent of the cargo unloaded at Anzio was carried by DUKWS.

There were many instances where DUKWS were used in the ETO to expedite the movement of troops, small vehicles and supplies during river crossings but in most of these cases the use of DUKWS was a last resort. It is felt that the use of DUKWS in river crossings and in pursuits and exploitations could be of great value, especially to the Infantry, in any future operations of this nature.

*start here!*  
Undoubtedly the greatest use made of DUKWS in the past war was on the Normandy beaches.

In planning operation "NEPTUNE" personnel familiar with DUKW operations were, for the first time in any operation, consulted by high level staff planners concerning the use of the DUKWS in the assault and succeeding phases of the operation. For the first time, DUKW companies were authorized and furnished adequate organic third echelon equipment. For the first time, consideration was given to the idea of giving the DUKW companies sufficient personnel to operate round the clock and last but not least DUKW units were given an opportunity to participate in the training of the units they were to support in the initial phases. One other lesson had been learned -- DUKWS were no longer to be hastily organized into provisional units or scattered individually throughout other units without adequate means for maintenance or operational control.

Training plans for operation "NEPTUNE", in so far as they pertained to DUKWS, were initially based on information

from the States which indicated that the additional DUKW units being furnished would be trained and fully equipped. They were fully equipped although their DUKWS did not arrive until sometime after the troops which was a serious training handicap. Most of the white companies were well trained as DUKW operators but their maintenance platoons were poorly trained especially in third echelon maintenance. This was largely due to the policy in the training center that all third echelon maintenance was to be performed at the Ordnance maintenance shops. In addition, the ability of the units to live and operate under field conditions left much to be desired.

The colored units were the biggest training problem. These units had been hastily activated and neither the officers were trained in DUKW operations. Although these units records indicated that they had been inspected, and their status of training approved, both by TC inspectors and by various Inspectors General it was found by actual count in three companies that approximately seventy percent of the men could not drive a vehicle of any kind. The bulk of the officers, while they had previously been stationed at the TCRTC, had held administrative jobs which did not require them to know anything about DUKW operations. The maintenance platoons were so poorly trained that it was necessary to farm out most of their maintenance to other companies. Despite vigorous protests to higher headquarters, no replacements were made available to replace these people nor could permission be obtained to leave them in the UK until they could be trained.

Maps, charts, hydrographic and weather information furnished the DUKW units prior to D day were excellent and this information was kept current to within an hour or so of sailing time. After the landing the weather information and tide tables furnished by the Air Force was "to little and to late" and the little amount of short range weather information received was not very accurate. Accurate short range forecasts would have been invaluable in planning day to day operations.

On D day the DUKWS assigned to Utah Beach landed on schedule and with comparatively light losses due to enemy fire and mines. Off Omaha Beach forty four out of one hundred fifty six DUKWS were lost, largely due to inexperience. These DUKWS had been loaded with a minimum of five tons each and some were loaded with as much as seven tons. Due conditions on the beach during the early stages of the assault were ordered not to land but rendezvous offshore and await further orders. Apparently no thought had been given to the fact that most of these vehicles had been put afloat fifteen miles offshore and that their normal range at sea without refueling is twenty eight nautical miles.



The water was too rough for the DUKWS to refuel in the open sea with the loads they were carrying. They were allowed to circle until their fuel was exhausted, their pumps stopped and they foundered. Other DUKWS were lost due to inexperienced drivers stowing gear in the bilges which clogged the pumps or placing gear over the air intakes which burned up the engines.

DUKWS helped solve the traffic problem on Utah Beach by making their own road over the sand dunes after engineers had blasted holes in the seawall.

As usual, DUKWS were forced to operate far inland due to lack of truck transportation. As more trucks became available this condition was corrected by the establishment of beach transfer points.

During the initial phases of the operation approximately eighty percent of the casualties were evacuated from holding points to hospital ships by DUKWS. This method of evacuation was faster, eliminated several handlings of the patients and also gave them a much smoother ride.

During the big storm of 19-22 June the DUKWS again demonstrated their seaworthiness and their value as cargo carriers. Due to the critical supply situation they were operated as long as cargo could safely be put over the sides of the ships and they were able to operate again as soon as the storm abated sufficiently to allow the ships gear to be worked. The DUKWS could safely negotiate the surf which was creating havoc among other types of landing craft and were safely ashore making maximum use of this unexpected free time to effect repairs and to rest. A few DUKWS were used to maintain a constant watch on the beach and were used to evacuate crews of other damaged craft; to evacuate AAA gun crews from ships forming the "Gooseberry" as they broke up; to carry rations to other AAA gun crews on the "Gooseberry"; and to take medical aid to injured crew members on cargo ships.

After the storm DUKWS were used extensively as towing craft in clearing the beaches. The maintenance platoons were invaluable in effecting hull repairs on the larger ships since they could mount their heavy duty welding equipment in DUKWS, travel easily from ship to ship and make the necessary repairs without leaving the DUKW.

Truck battalion headquarters which were given command of DUKW companies were inefficient due to lack of training in DUKW operations and the result was that operational control had to be centralized in the experienced battalion headquarters which placed an undue burden on such units.

Once again maintenance, maintenance supplies and maintenance personnel were a serious problem. In the colored companies it was necessary to have practically all of the second and third echelon maintenance performed by PW mechanics. White companies also had to re-inforce their maintenance platoons with PW mechanics due to the lack of spare

parts. Hulls were patched with salvaged metal from tank shrouds; exhaust tubes were made by welding sections of steel pipe; manifolds had to be welded and rewelded; control cable had to be salvaged from wrecked aircraft and gliders or made from barrage balloon cable; strut bearings were made from apple wood and strut bearing caps from angle iron; brass for repairing propellers was obtained by cutting shell casings into small strips. Only a few spare tires were available and the tire repair units when they finally arrived were not equipped to repair DUKW tires. Ordnance Heavy Maintenance units were not equipped to make repairs to electrical units, propellers or propeller shafts. Informal arrangements were made with nearby Air Corps units to obtain aircraft control cable on a few hours notice from the UK. Navy repair ships were also of immense aid to the DUKW units when they were in the vicinity of the beaches. They repaired electrical units, propellers and propeller shafts rapidly, the workmanship was excellent and there was no red tape involved. All of this extra maintenance burden on the DUKW units could have been avoided by proper staff planning at higher levels.

One of the unforeseen problems that was encountered, especially in the colored units, was a reluctance on the part of some drivers to operate alone at night at sea under blackout conditions or ashore when they were subject to sniping fire. Many of these men had a very real fear of the water and should never have been assigned to a DUKW unit.

Many of the officers and some of the men in the new DUKW units were overage or limited service and were not physically capable of enduring sustained round-the-clock operations in rough water which is the rule rather than the exception in the English Channel.

Signal communications ashore were excellent but shore to ship communications were poor due to lack of trained signal personnel and the lack of suitable equipment. Poor ship to shore communications resulted in delays in shifting DUKWS to ships which needed them from ships which had a surplus of DUKWS waiting to be loaded.

The Navy had some difficulty in locating incoming ships and getting them anchored in the right place at the right time. This function was taken over by the Engineer Special Brigades and DUKWS equipped with radios were diverted for use as control boats since the boats of the Harborcraft company were not sufficiently sturdy or seaworthy.

Another drain was placed on the experienced DUKW companies personnel by poorly trained and poorly equipped Port companies. It was necessary to organize rigging crews from DUKW companies personnel to meet incoming ships with necessary gear and rig the ships for DUKW operations. They were also frequently called on to repair damaged hoisting gear and to make slings, barrel hooks, etc.

There is practically no information available as to the use made of the DUKWS in the major continental ports. Reports indicate that the DUKW units at Cherbourg were very efficient and were responsible for unloading a considerable part of the cargo which passed through that port.

At LeHavre the DUKWS were not used efficiently. At one time there were ten companies at the port and due, partly to lack of training but largely due to lack of proper supervision, some of these companies could only muster eight operational DUKWS per day. With the ideal operating conditions which prevailed at this port and the ports limited capacity for handling cargo ashore, two or three properly trained companies would have been sufficient.

Considerable experimental work was done in conjunction with the Engineers using DUKWS in bridging and ferrying operations in preparation for the Rhine crossings. From what little information is available, it appears that they were used successfully.

## Conclusions

1. The DUKW is a sturdy, seaworthy vehicle and an efficient cargo carrier when operated by properly trained personnel and its versatility makes it invaluable in amphibian operations.
2. More DUKW units will be required in any major operation in the near future because of the probable destruction of major ports by atomic missiles.
3. The DUKW is a specialized piece of equipment and personnel intended to operate it require extensive specialized training in addition to thorough basic training.
4. As they are now organized, DUKW companies and battalion headquarters do not have sufficient personnel for efficient round-the-clock operations.
5. If maximum efficiency is to be obtained from new types of equipment as it is adopted by the Army, more closely coordinated staff planning at the higher levels is necessary to assure that properly selected and trained personnel are available to operate the equipment and that adequate parts, materials and equipment are available for maintaining it.