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The Shipping Crisis in the Soviet Eastern Arctic at the Close of the 1983 Navigation Season

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ABSTRACT. During September 1983 an unusually early freeze-up and persistent northwesterly winds that drove heavy multi-year ice into Proliv Longa and against the north coast of Chukotka resulted in a critical situation with regard to shipping in the Soviet eastern Arctic. Ports such as Zelenyy Mys and Mys Shmidta were prematurely closed by ice, leaving Pevek as the only functioning port in this part of the Arctic. Worse still, dozens of ships were beset in the ice at various points from the mouth of the Indigirka east to Bering Strait. One freighter, *Nina Sagaydak*, was crushed and sank near Kosa Dvukh Pilotov on 8 October; a sister ship, *Kolya Myagotin*, was badly holed and barely managed to limp out of the Arctic. Practically all available ice breakers, including the nuclear-powered icebreakers *Lenin*, *Leonid Brezhnev* and *Sibir'*, were transferred from the western to the eastern Arctic to free the jammed ships. Ultimately all were rescued, but it was late November before the last ship sailed from Pevek. Many ships were forced to head west from Pevek to the Atlantic, rather than attempt to battle their way through the heavy ice in Proliv Longa in order to return to their Pacific home ports. Singled out for particular praise in Soviet post-mortems of the crisis were the nuclear-powered icebreakers and the new *Noril'sk* class (SA-15) icebreaking freighters, several of which came straight from the Finnish shipyards to help rectify the situation in the eastern Arctic.

Key words: Soviet eastern Arctic, Soviet Union, navigation, icebreaker

RÉSUMÉ. En septembre 1983, un gel plus tôt que d'ordinaire et des vents persistants du nord-ouest qui poussèrent de la vieille glace épaisse dans la Proliv Longa et contre la côte nord de Chukotka créèrent une situation critique quant à la navigation dans l'est de l'Arctique soviétique. Des ports tels Zelenyy Mys et Mys Shmidta furent fermés prématurément par la glace, ne laissant que Pevek comme seul port ouvert dans cette partie de l'Arctique. Des douzaines de navires furent pris dans la glace à divers endroits entre l'embouchure de l'Indigirka et le détroit de Béring à l'est. Un navire de charge, le *Nina Sagaydak*, fut écrasé et coula près de Kosa Dvukh Pilotov le 8 octobre; son navire jumeau, le *Kolya Myagotin*, fut gravement percé et ne réussit que de peu à se traîner hors de l'Arctique. Presque tous les brise-glaces, y compris les brise-glaces à propulsion nucléaire le *Lenin*, le *Leonid Brezhnev* et le *Sibir'* furent transférés de l'ouest à l'est de l'Arctique afin de libérer les vaisseaux pris dans les glaces. Tous furent secourus éventuellement mais le dernier navire ne quitta Pevek qu'à la fin-novembre. Plusieurs d'entre eux durent naviguer vers l'ouest à partir de Pevek, en direction de l'Atlantique, plutôt que de tenter de se frayer un passage à travers l'épaisse glace dans la Proliv Longa afin de retourner à leurs ports d'attache dans la Pacifique. Les brise-glaces à propulsion nucléaire et les nouveaux navires de charge de catégorie *Noril'sk* (SA-15) furent louangés dans les analyses subséquentes; plusieurs de ces navires vinrent directement des chantiers navals en Finlande pour aider à rectifier la situation dans l'est de l'Arctique soviétique.

Mots clés: l'est de l'Arctique soviétique, l'Union Soviétique, navigation, brise-glaces

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INTRODUCTION

Since the earliest years of the Soviet regime, but especially since 1934, the Soviet government has placed heavy emphasis on the importance of developing the Northern Sea Route as a commercial shipping route. The progress toward this end has been comprehensively summarized and analyzed by Armstrong (1952, 1980). The achievements attained during this half century are truly impressive. In the western sector of the Arctic the navigation season has been extended to a full twelve months. Thus, for example, shipments of nickel ore (from Noril'sk) moving west from the port of Dudinka on the Yenisey to Murmansk are interrupted only for a few weeks during the month of June, and even this is due to the annual flood associated with break-up on the Yenisey rather than with ice conditions at sea. The stated long-range goal is to achieve year-round navigation along the entire Northern Sea Route (Armstrong, 1984).

The Soviet Union has accumulated an extremely impressive fleet of icebreakers and ice-strengthened freighters for operation in arctic waters. It includes at least 14 polar icebreakers, three of which (*Lenin, Leonid Brezhnev* and *Sibir'*) are nuclear-powered; a fourth nuclear-powered icebreaker, *Rossiya*, is now fitting out and should go into service in the near future. Among the ice-strengthened freighters the most recent and most impressive additions to the fleet are the 14 ships of the *Noril'sk* or SA-15 class; these are vessels of 19 500 tonnes dead weight. With this powerful fleet of ships and with a sophisticated support system involving weather stations, ice reconnaissance aircraft and satellites, until the summer of 1983 it appeared that the aim of year-round navigation along the entire Northern Sea Route was neither unrealistic nor unattainable.

But as the season unfolded reports of very severe ice conditions in Proliv Longa, between Ostrov Vrangelya and the mainland (Fig. 1), of large numbers of ships being jammed in the ice, and finally of a ship being crushed and sunk provided the evidence that despite the sophistication of the icebreakers and support systems arrayed against it, the arctic ice could still disrupt shipping severely.

The crisis and the means taken to tackle it were very widely reported in the Soviet press, and this account of the crisis is based almost entirely on those reports. The subject was handled in most Soviet newspapers as a demonstration of the skill, heroism and devotion to duty of Soviet seamen and scientists in avoiding what might clearly have become a much more serious disaster. The fact that no lives were lost and that there

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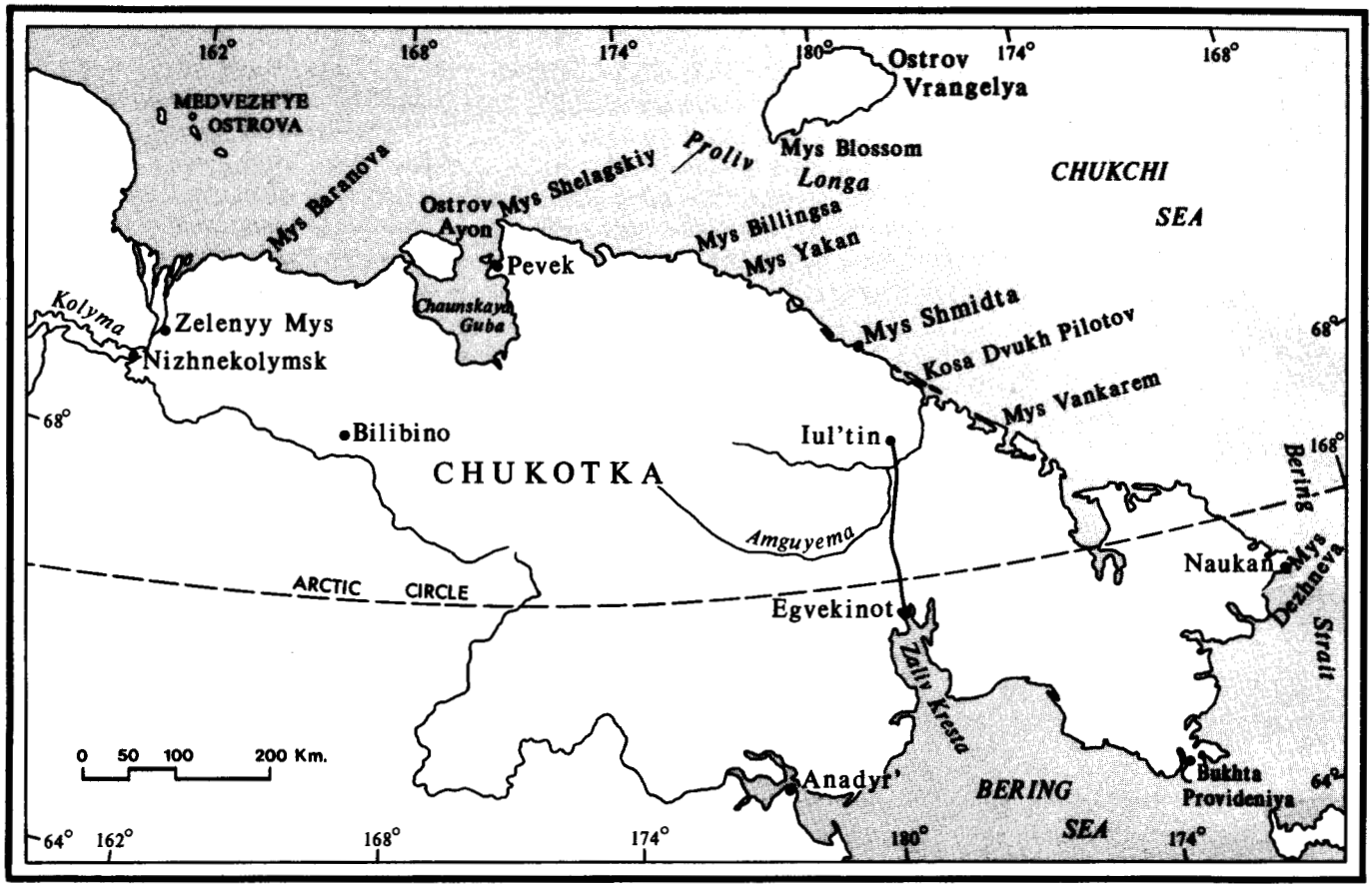

FIG. 1. Chukotka, showing the main locations associated with the 1983 shipping crisis.

were no serious injuries is indeed a tribute to the efficiency and skill of those involved in the rescue operations. After the event a series of "post-mortems" appeared in the Soviet press, wherein blame was allocated with considerable candour.

It must be recognized that the Soviet media's information should be treated with some caution in terms of its reliability. However, the fact that the sources used in compiling this account include six separate newspapers, all of which varied in minor details but agreed on major points, would suggest the picture presented here is reasonably accurate. And certainly the Landsat image of icebreaker tracks off Kosa Dvukh Pilotov (Fig. 16) provides incontestable confirmation of the Soviet press accounts of the rescue of ships from that location within the previous few days.

THE SETTING

The 1983 season appeared to start fairly normally. Thus, for example, the freighter *Nizhneyansk* (Fig. 2), the first freighter to call at the port of Pevek in 1983, arrived there on 24 June. Similarly the first convoy reached Mys Shmidta on the usual date, 11 June (Martyshin, 1983d), but significantly the freighters were able to get alongside to unload only two weeks later due to ice. Later in the season, however, things were far from normal; from early August onward, ice concentrations were substantially heavier than usual, especially in Proliv Longa. The situation appears to have arisen from a severe early drop in temperatures; thus, for example, new ice began to form some two weeks earlier than usual along the whole of the Chukotka coast (*Vodnyy Transport*, 1983a). Worse still, this unusual cold was combined with strong, persistent northwesterly winds. The latter drove the Ayon ice massif, a semi-permanent field of multi-year ice normally located north of Ostrov Ayon but usually retreating far enough north over the summer to permit free passage south of it, hard against the Chukotka coast from Mys Shelagskiy to Mys Billingsa. To the east it was equally solidly jammed against another semi-permanent ice massif, the Vrangel', so that between the two of them they effectively blocked Proliv Longa.

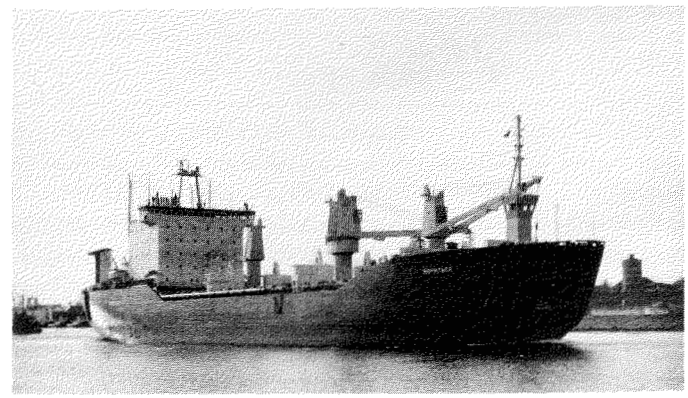

FIG. 2. *Noril'sk*, sister ship to the SA-15 icebreaking freighters *Arkhangel'sk*, *Bratsk*, *Igarka*, *Monchegorsk*, *Nizhneyansk* and *Okha*, which played such a distinguished role in the crisis. (Photo: R. Gierke)

Aware of the dangerous situation developing, the authorities diverted four icebreakers from their area of operations in the western Arctic, the nuclear-powered icebreakers *Lenin* (Fig. 3) and *Leonid Brezhnev* (Fig. 4) and the conventional icebreakers *Kapitan Sorokin* (Fig. 5) and *Kapitan Dranitsyn* (Daygorodov and Martyshin, 1983b). Their help was soon needed. By early October groups of freighters and icebreakers were jammed helplessly in the ice at various points between the Novosibirskiye Ostrova and Bering Strait. And it was not long before reports of serious damage began to be received.

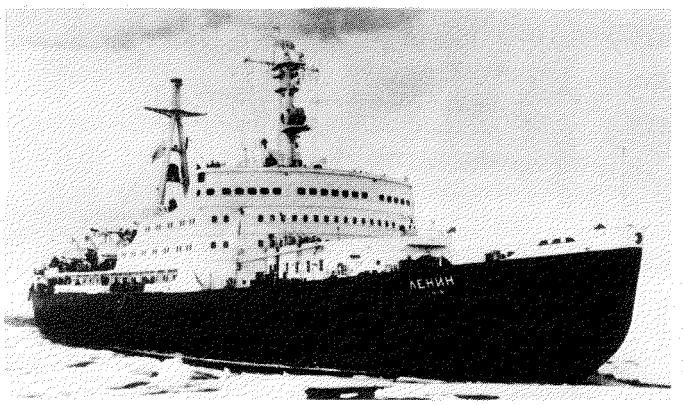

FIG. 3. The nuclear-powered icebreaker *Lenin*. (Photo: E.A. Wilson collection)

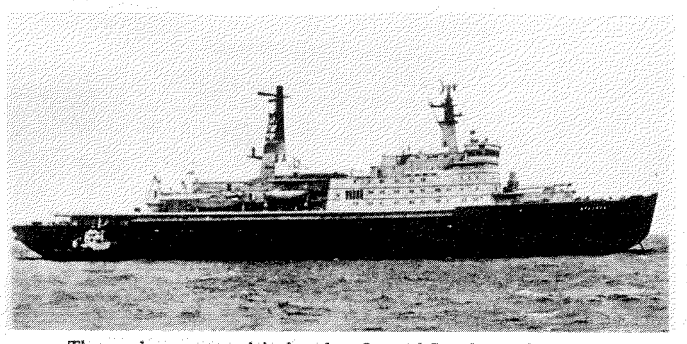

FIG. 4. The nuclear-powered icebreaker *Leonid Brezhnev*, formerly *Arktika*. (Photo: E.A. Wilson collection)

FIG. 5. *Kapitan Sorokin*, a shallow-draft icebreaker designed especially for work in estuaries. Her sister ships *Kapitan Nikolayev*, *Kapitan Dranitsyn* and *Kapitan Khlebnikov* were also deeply involved in the 1983 crisis. (Photo: E.A. Wilson collection)

THE CASUALTIES

Early in October the freighter *Nina Sagaydak* (Fig. 6), one of a convoy of ships westward bound to Pevek that was caught by the ice near Kosa Dvukh Pilotov, a little to the east of Mys Shmidta, found herself in serious difficulties. Built at Rostock, East Germany, by the Schiffswerft Neptun in 1970, *Nina Sagaydak* was one of a class of 31 almost identical small freighters of between 3411 and 3684 gross tons; she was 105.7 m long, with a beam of 15.65 m and engines of 3250 bhp, giving her a top speed of 13.75 knots. On 6 October 1983 she was caught in multi-year ice 3-m thick being driven against the edge of the fast ice, and soon irresistible ice pressures began to build up (Shmyganovskiy, 1983a; *Vodnyy Transport*, 1983a). Massive pressure ridges piled up against her sides, with enormous ice blocks tumbling over her rails. Her stern was forced against the fast ice and her rudder and propeller were jammed.

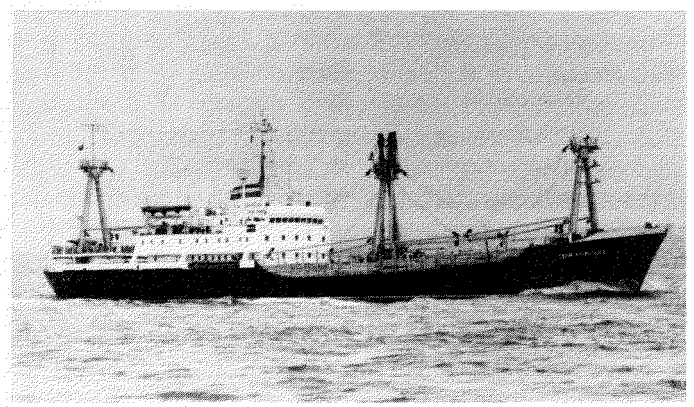

FIG. 6. The freighter *Galya Komleva*, which played a minor role in the crisis. Her sister ship *Nina Sagaydak* was crushed and sank, while another sister ship, *Kolya Myagotin*, was severely damaged. Other sister ships involved were *Tolya Shumov*, *Borya Tsarikov* and *Vitya Sinitsa*. (Photo: E.A. Wilson collection)

To compound the difficulties the freighter next collided with the tanker *Kamensk-Ural'skiy* (Fig. 7), also drifting helplessly in the ice (*Vodnyy Transport*, 1983b). For over half an hour the ships ground against each other, and despite frantic efforts to place fenders between the two hulls, both ships received some damage; *Nina Sagaydak* came off worst. Her crew was rather startled to see the tanker's crew pouring water down the sides of their ship at the points of contact between the hulls in case sparks caused by the grinding and pounding might ignite fumes from the tanker's cargo. The two ships ultimately drifted apart, but even worse was in store for *Nina Sagaydak*.

As the ice pressures continued, her hull plates began to crack and the water began to rise inexorably in the engine room. Despite every effort her pumps were unable to cope with the enormous influx of water and the ship began to list heavily to starboard. When the list had reached the alarming angle of 40° the chief engineer brought all his men on deck and the captain gave orders for the crew of 45, and a further 6 men accompanying the ship's cargo, to be lifted off by helicopters from the icebreakers *Kapitan Sorokin* and *Vladivostok*, which were standing by, unable to save the sinking vessel.

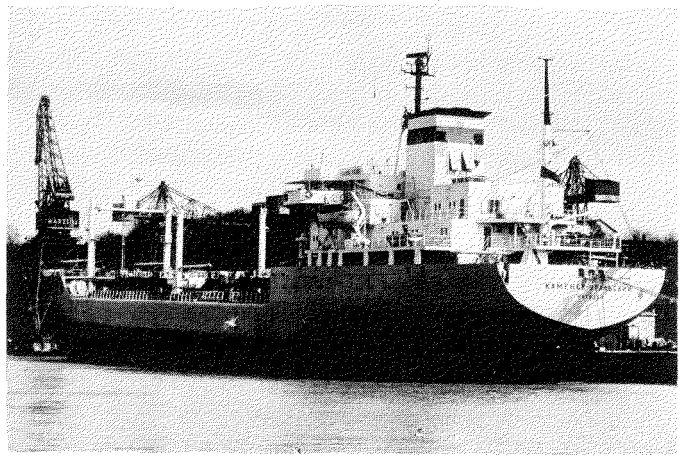

FIG. 7. The tanker *Kamensk-Ural'skiy*, which was heavily involved in the 1983 crisis; sister ships that also played important roles were *Samotlor*, *Urengoy*, *Berezovo*, *Nizhnevartovsk*, *Usinsk*, *Yeniseysk* and *Igrim*. (Photo: B. Sjostrom)

The ship stubbornly remained afloat, held up by the ice and with her engines and pumps still running unattended for almost a day. Finally, early on the evening of 8 October, while her crew watched helplessly from *Kapitan Sorokin* barely a ship's length away, *Nina Sagaydak* sank by the head. Her crew was flown south to Vladivostok (*Vodnyy Transport*, 1983a), and a commission of enquiry into the loss of the ship was convened at Pevek. It concluded that no blame attached to any of the officers or crew members and that everything possible had been done to save the ship.

Nina Sagaydak was the first ship to be sunk by ice in the Soviet Arctic since the brand-new freighter *Vitimles* was crushed and sank in October 1965. But for a while it appeared highly probable that several more ships might share *Nina Sagaydak*'s fate.

On the day that she sank, her sister ship *Kolya Myagotin*, built in Rostock in 1969 and now one of a convoy of ships eastward bound through Proliv Longa, found herself in difficulties midway between the eastern end of Ostrov Vrangelya and the mainland. Caught between two massive ice floes, she was holed first in the bow section, where tanks beneath number-3 hold were crushed (Daygorodov and Martyshin, 1983a). Then she was holed along a 7-m length of her side in the area of number-2 hold. The latter filled with water in less than half an hour. As a precaution most of her crew was evacuated by helicopter to the icebreakers *Kapitan Khlebnikov* and *Yermak*, which were standing by, while a skeleton crew of five battled to keep the ship afloat. But finally even this group was forced to abandon ship as the ice continued to squeeze her hull. They left the engines, diesel generators and pumps running. Then from the safety of the nearby icebreakers Kapitan Tsikunov and his crew settled down to await events.

Next day the ice slackened and the floes gripping the ship separated; she heeled some 30° to port, then rolled back to starboard. Ultimately she ended up on an even keel—still afloat. Encouraged by this, and with permission from headquarters at Pevek, Tsikunov led his men back aboard and they renewed the battle for the ship's life. Divers applied a patch to the worst hole, and the job of pumping out number-2 hold began; by the 11th the water depth had dropped to only 50 cm (Balakirev, 1983a) and the crew could start work on placing cement patches inside the hull. For this task large amounts of sand and cement were required; these were ferried out from shore by helicopter. By midnight on 14 October 1½ tonnes had already been delivered. Once the cement patches were securely in place and the water pumped out, the icebreakers *Kapitan Khlebnikov* and *Magadan* broke *Kolya Myagotin* loose and began the slow, tedious task of escorting her out to the edge of the ice, some 115 km to the east (Daygorodov and Martyshin, 1983a).

It was a frustrating trip; the outer patch on one occasion was torn off by the ice and the water level again rose in the hold. Once more the divers had to struggle in the icy water to replace the patch; once they had succeeded, the water was pumped out and the slow progress eastward was resumed. At one stage a message was received from headquarters at Pevek to the effect that the task should be abandoned if it appeared totally hopeless. The pumps already in operation simply could not handle the inflow of water; but another two pumps were flown out to the ship and soon the water level began to drop. Later 30 empty containers were unloaded onto the ice and some full ones were transferred to the freighter *Okha* (Daygorodov and Martyshin, 1983d), giving the repair crews easier access to the holes in the hull.

Finally the crippled ship reached open water at about 177°W on 17 October (Daygorodov and Martyshin, 1983c), and since the leaks were now under control Tsikunov wanted to push on eastward to Bering Strait. But the authorities at marine operations headquarters at Pevek were more cautious; they wanted to avoid any possibility of *Kolya Myagotin* running into a storm and knew that gale-force winds with heavy seas were forecast for the Bering Strait area. Hence the following message was transmitted to Tsikunov: "Do not begin without permission. You will be given a marine forecast every six hours" (Gorbacheva and Zhityakov, 1983a). *Kapitan Khlebnikov* and *Magadan* were ordered to continue to stand by her where she lay in the relative security of the edge of the pack and to escort her to Bukhta Provideniya when conditions improved.

Finally on 21 October, when the forecasts seemed auspicious, *Magadan* took the crippled ship in tow on a 350-m towline for the 640-km run to Bukhta Provideniya; *Kapitan Khlebnikov* was still standing by (Sergeyev, 1983a). Next day they had reached the longitude of Mys Dezhneva (Daygorodov and Martyshin, 1983e) and on the 23rd emerged through Bering Strait into the Bering Sea (*Izvestiya*, 1983a). Even now the pumps were still operating nonstop in order to keep the ship afloat; two more pumps had been set up in number-2 hold, for a total capacity of 750 $m^3 \cdot h^{-1}$, and the water level was dropping steadily. *Kapitan Khlebnikov*'s captain estimated that they would reach Bukhta Provideniya at 2300 on the 23rd. And indeed this forecast was accurate almost to the minute (Daygorodov and Martyshin, 1983f); at 2300 *Magadan* and the salvage tug *Bars* eased *Kolya Myagotin* up to the quayside (Daygorodov and Martyshin, 1983g).

Despite the fact that Bukhta Provideniya does not possess a dry dock or any proper facilities for repairs to the hull of a ship of *Kolya Myagotin*'s size, work on the ship began almost immediately. About 30 containers and 160 tonnes of lumber (some of it actually destined for Bukhta Provideniya) were unloaded; then some scrap metal was transferred from number-1 hold to number-4 hold, all of this with a view to heeling the ship. Once the damaged section was above the water, repair crews went to work (Daygorodov *et al.*, 1983). From this point on *Kolya Myagotin* was no longer mentioned in the periodic "crisis reports" transmitted from Pevek, since she was considered to be completely out of danger (Sergeyev, 1983b). Once the damage to her hull had been properly patched, *Kolya Myagotin* started on the long voyage south to Vladivostok, where permanent repairs would be made. Her captain and crew and the men of *Kapitan Khlebnikov* and *Magadan* could rightly be proud of what they had achieved.

THE CRISIS UNFOLDS

When the first Soviet newspaper reports of trouble in the eastern Arctic began to appear toward the middle of October, it was clear that the situation was quite serious. The group of ships with which *Nina Sagaydak* was travelling — freighters *Pioner Kamchatki* (Fig. 8), *Pioner Rossii*, *Pioner Uzbekistana* and *Amguyema* (Fig. 9), tankers *Urengoy* and *Kamensk-Ural'skiy* and escorting icebreakers *Kapitan Sorokin* and *Leningrad* (Fig. 10) — was firmly jammed off Kosa Dvukh Pilotov (Balakirev, 1983a). A situation report from the captain of *Leningrad* on 11 October included the following information: wind NW, 12 mps; temperature −13°C; fog; snow; visibility 2-3 cables; 10 tenths ice; pressure force 1-2. In 3½ hours *Leningrad* had managed to advance one ship's length. The nuclear-powered icebreaker *Leonid Brezhnev* had sailed from Pevek on Chaunskaya Guba to come to the convoy's rescue, but it was significant that her divers had only just finished replacing blades on one of her three propellers that had been lost earlier in heavy ice (Shmyganovskiy, 1983a), a task that had taken them two days (Kurasov, 1983). Initially on leaving Pevek *Leonid Brezhnev* was escorting the freighter *Igarka* and in two hours had managed to escort her 30 km. But then *Igarka*'s steering gear was damaged, and while her crew set about repairs *Leonid Brezhnev* pushed on eastward alone (Daygorodov and Martyshin, 1983b). By 14 October *Igarka* was again under way, forging westward through the ice on her own.

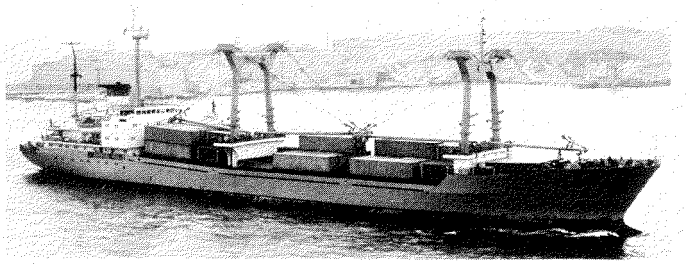

FIG. 8. The freighter *Mikhail Sten'ko*, whose sister ships *Pioner Kamchatki*, *Pioner Chukotki*, *Pioner Rossii* and *Pioner Uzbekistana* all played prominent parts in the 1983 crisis. (Photo: M. Cassar)

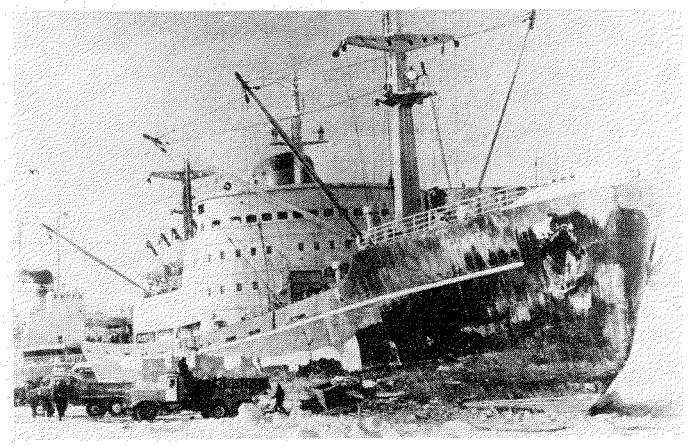

FIG. 9. *Gizhiga*, an icebreaking freighter and almost identical sister ship to *Amguyema*, *Kapitan Gotskiy*, *Vankarem*, *Kapitan Markov*, *Vasiliy Fedosoyev* and *Kapitan Kondrat'yev*. (Photo: Claus Rothe)

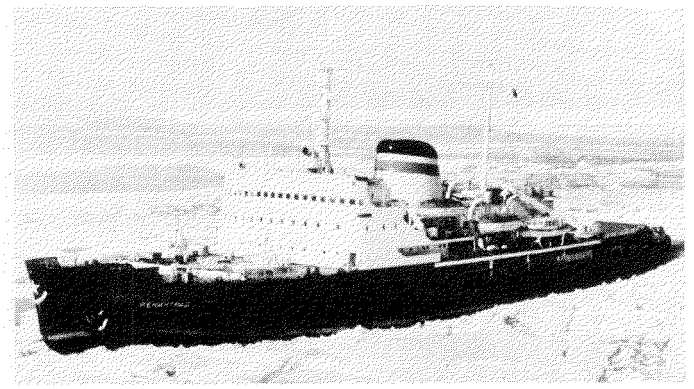

FIG. 10. The icebreaker *Leningrad*, which after sterling work had to retreat from the Arctic with engine trouble. Sister ships also heavily involved were *Murmansk* and *Vladivostok*. (Photo: E.A. Wilson collection)

Farther west, to the west of Ostrov Ayon in the East Siberian Sea, another convoy was beset and drifting. It consisted of the *Noril'sk* class freighter *Nizhneyansk*, the tanker *Nizhnevartovsk* and the refrigerated ship *Khudozhnik S. Gerasimov* (Fig. 11). Heading to their rescue on 12 October were the nuclear-powered icebreaker *Lenin* and the *Noril'sk* class freighter *Arkhangel'sk* (*Vodnyy Transport*, 1983a). On the 14th it was reported that *Lenin* had broken through the barrier of the Ayon massif leading a convoy consisting of *Arkhangel'sk*, *Vasiliy Yan*, *Fedor Okhlopkov* and *Isidor Barakhov*, all bound for Tiksi. Then, turning around, *Lenin* escorted *Nizhneyansk* and *Khudozhnik S. Gerasimov* back to Pevek while *Arkhangel'sk* continued west with the other freighters (Daygorodov and Martyshin, 1983b).

Also on the 14th several of the ships jammed near Kosa Dvukh Pilotov managed to get free with the help of *Leonid Brezhnev*, *Yermak*, *Admiral Makarov* and *Vladivostok* and emerged at the eastern edge of the ice in the Chukchi Sea, having battled through about 100 km of ice. They included the freighters *Borya Tsarikov*, *Yevgeniy Chaplanov*, *Vladimir Mordvinov* and *Pioner Kamchatki* (*Sovetskaya Rossiya*, 1983a; Daygorodov and Martyshin, 1983b).

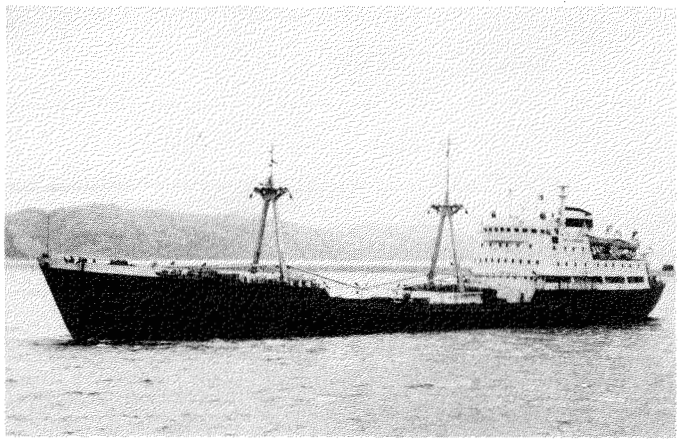

FIG. 11. The refrigerated ship *Imeni 61 Kommunara*, sister ship to *Khudozhnik S. Gerasimov*. (Photo: E.A. Wilson collection)

By the 17th, with daylight steadily shortening and a temperature at Pevek of −25°C, there were several significant developments in the critical situation. Although she had lost a blade from one propeller, *Leonid Brezhnev* was successfully continuing her struggle to free the ships jammed near Kosa Dvukh Pilotov. By now the number of these ships that had reached the edge of the ice in the Chukchi Sea had risen to nine (Daygorodov and Martyshin, 1983c). And by the 17th the first of them, *Borya Tsarikov* and *Vladimir Mordvinov*, were already approaching Bering Strait.

However, there were still five ships in a serious situation off Kosa Dvukh Pilotov, with *Kapitan Sorokin* and *Leningrad* standing by. Having freed all the others, *Leonid Brezhnev*, *Admiral Makarov* and *Yermak* were now heading for this last handful, the latter two ships having resupplied and bunkered from the freighter *Okha*.

Much farther west *Arkhangel'sk* (Kapitan R. Igritskiy), now joined by the icebreaker *Semen Chelyuskin*, had succeeded in escorting *Vasiliy Yan*, *Fedor Okhlopkov* and *Isidor Barakhov* to Tiksi (Fig. 12). From there, escorting the freighter *Konstantin Petrovskiy*, *Arkhangel'sk* was now pushing on westward to Proliv Vil'kitskogo. Ahead of her *Dikson*, escorting *Galya Komleva*, was approaching the eastern end of that strait by the 17th. Passing through the strait eastward bound was the nuclear-powered icebreaker *Sibir'* (Fig. 13), which had just escorted a convoy of eight ships westward. They were now all proceeding across the Kara Sea independently, with the exception of *Kapitan Gotskiy*, which the icebreaker *Murmansk* was escorting (Daygorodov and Martyshin, 1983c).

There were still two groups of ships in trouble in the East Siberian Sea; the freighters *Vankarem*, *Baykonur*, *Mekhanik Zheltovskiy* and *Tolya Shumov* were beset between the Medvezh'iye Ostrova and Mys Lopatka. Farther west, off the mouth of the Indigirka, *Berezovo*, *Novik* (Fig. 14) and *Solnechnyy* were in a similar predicament. *Lenin*, which had lost a propeller blade, was battling to extricate the tanker *Nizhnevartovsk* from the ice near Ostrov Ayon, assisted by *Kapitan Dranitsyn*. And finally *Igarka* and six ships a short distance away from her were jammed near Mys Shelagskiy.

Apart from all these a further nine vessels were lying at Pevek, waiting for an opportune moment to try to escape to the

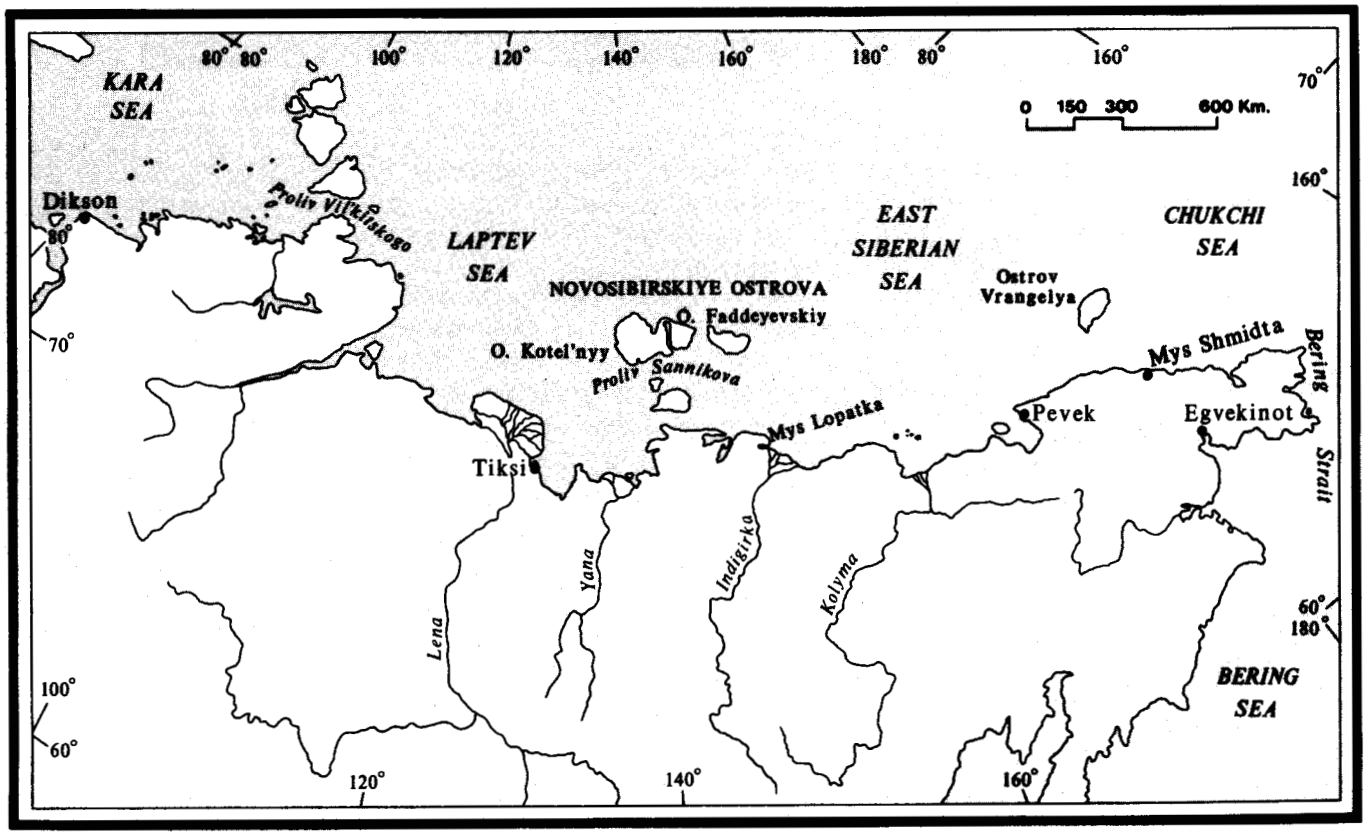

FIG. 12. The eastern half of the Northern Sea Route.

FIG. 13. The nuclear-powered icebreaker *Sibir'*. (Photo: E.A. Wilson collection)

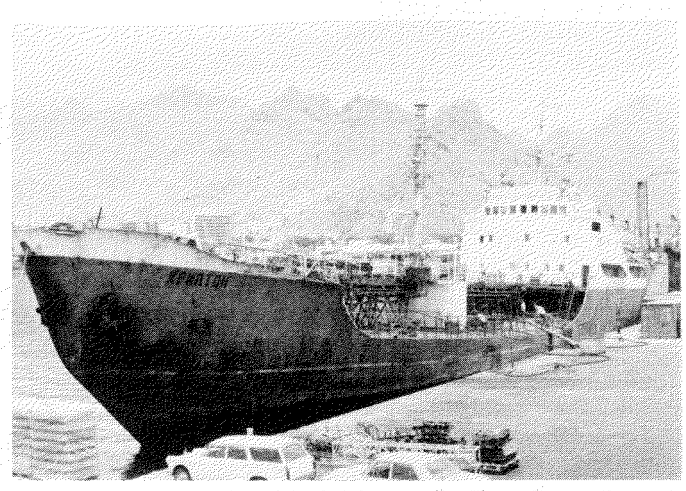

FIG. 14. *Kripton*, a sister ship of the freighter *Novik*. (Photo: E.A. Wilson collection)

west. Among them were *Khudozhnik S. Gerasimov*, which had just docked after being extricated from the ice by *Lenin* and *Kapitan Dranitsyn*, and the freighter *Kapitan Samoylenko*, which the longshoremen had just discharged in two days instead of the normal three. Now unloading was *Nizhneyansk*, which *Lenin* had just escorted to port, on her third trip of the season (Gorbacheva and Zhityakov, 1983a; Kurasov, 1983). Also lying in the port were the freighter *Bratsk* and the old icebreaker *Georgiy Sedov*, which the former ship had towed in minus three propeller blades and with her rudder out of action. On the 17th the port officials and longshoremen were gearing up to receive the tanker *Nizhnevartovsk*, but deteriorating ice conditions had brought the tanker to a complete halt practically within sight of the port, despite the efforts of *Lenin* and *Kapitan Dranitsyn* (Zhityakov, 1983).

That afternoon a radio message reached marine operations headquarters at Pevek from the the freighter *Vladimir Mordvinov*: "At 1500 we emerged from the ice edge into open water; now approaching Bering Strait. We thank headquarters for their recommendations and help. We wish you a successful completion of the season. Kapitan Maslov" (Zhityakov, 1983). *Vladimir Mordvinov* was the first of the ships caught in the ice of Proliv Longa to escape to the east; it had taken her two weeks.

By 19 Ocotober *Leonid Brezhnev*, *Yermak* and *Admiral Makarov* had reached the remainder of the ships jammed off Kosa Dvukh Pilotov; these were the tankers *Kamensk-Ural'skiy* and *Urengoy* and the freighters *Amguyema*, *Pioner Uzbekistana* and *Pioner Rossii*, all bound for Pevek (Daygorodov and Martyshin, 1983d). With *Leonid Brezhnev* leading the way, followed by *Yermak*, and with *Admiral Makarov* bringing up the rear towing *Kamensk-Ural'skiy*, the icebreakers started west; this was an unprecedented operation — three icebreakers with a total horsepower of 163 000 hp escorting a single tanker (Sergeyev, 1983a). Even so, progress was frustratingly slow in the immensely heavy ice; in the first eight hours *Kamensk-Ural'skiy* had progressed only two cable lengths.

Meanwhile, having escorted *Nizhnevartovsk* into Pevek, *Lenin* was lying off that harbour at the floe edge while her divers replaced her broken propeller blade. *Kapitan Dranitsyn* had already put to sea again early on the 19th (Gorbacheva and Zhityakov, 1983a). Off Mys Shelagskiy she had broken loose the three freighters *Anton Buyukly*, *Kapitan Samoylenko* and *Igarka* and had begun escorting them west. Here too progress was painfully slow: only some 11 km in 2 hours. Four other freighters were waiting for assistance in the ice off Mys Shelagskiy, and the two groups mentioned earlier were still waiting off the Medvezh'iye Ostrova and off the Indigirka.

But even farther west the news was more encouraging. *Dikson*, escorting *Galya Komleva*, had passed through Proliv Vil'kitskogo and was forging west across the Kara Sea. In the Laptev Sea *Arkhangel'sk* was ploughing west with the freighter *Konstantin Petrovskiy*. En route they had passed the icebreaker *Kapitan Nikolayev*, yet another icebreaker transferred from the west to assist the 12 already working in the eastern Arctic. By the 19th she was approaching Proliv Sannikova, having escorted ships to Tiksi.

At Pevek *Nizhnevartovsk* was alongside and had begun discharging cargo; *Khudozhnik S. Gerasimov* was also still being unloaded. At the same time port workers were repairing unspecified damage suffered by both ships. On 20 October Pevek recorded a record low temperature for that date: −26°C (Sergeyev, 1983a). To compound the difficulties severe magnetic storms were producing an almost complete radio blackout. The following day it was predicted that by the 23rd there would not be a single sea-going ship left in Pevek harbour; only a fleet of seven river/sea vessels operated by *Severo-Vostochnoye upravleniye morskogo flota* and the harbour icebreaker *V. Poyarkov* were scheduled to winter at Pevek (Sergeyev, 1983a; Pushkar', 1983).

By 21 October *Kapitan Dranitsyn* had successfully escorted *Igarka*, *Kapitan Samoylenko* and *Anton Buyukly* as far as the Medvezh'iye Ostrova, returned to Mys Shelagskiy, and started back west with five ships. They included *Vitya Sinitsa* and the tanker *Nizhnevartovsk*, which *Lenin* had escorted north from Pevek to the rendezvous. By noon on the 21st *Kapitan Dranitsyn* was abeam of Mys Bol'shoy Baranov with this second convoy (Daygorodov and Martyshin, 1983e). In the meantime *Kapitan Nikolayev* had reached the Medvezh'iye Ostrova from the west, freed *Vankarem*, *Tolya Shumov*, *Me-*

khanik Zheltovskiy and *Baykonur* and started back west with them; off the mouth of the Indigirka *Berezovo, Novik,* and *Solnechnyy* joined the convoy.

In Proliv Longa *Leonid Brezhnev, Yermak* and *Admiral Makarov* had by this point rescued the two tankers *Kamensk-Ural'skiy* and *Urengoy*, escorting them slowly to a "safe zone". While *Yermak* stayed with the two tankers, the other two icebreakers headed back to Kosa Dvukh Pilotov and next broke loose the freighter *Pioner Rossii* (Daygorodov and Martyshin, 1983e). Meanwhile the tanker *Igrim* was still waiting patiently, jammed off Mys Yakan. On 21 October Pevek recorded a temperature of −31°C (Daygorodov and Martyshin, 1983e).

A report from Pevek listed some of the ships that had by now undergone repairs there due to ice damage. Apart from ships already mentioned, it included *Pioner Chukotki, Pioner Uzbekistana, Kapitan Kondratyev, Komiles, Kolya Myagotin* and *Maksim Ammosov.*

It would appear that even at this stage the authorities felt the worst was still to come. It was decided on 24 October to transfer yet another icebreaker, *Krasin*, from the western Arctic to the crisis zone in the east (Loginov, 1983a). On that same date *Sibir'* rendezvoused in Proliv Sannikova with *Lenin, Kapitan Dranitsyn* and *Kapitan Nikolayev,* escorting a total of eleven ships (Daygorodov and Martyshin, 1983f). *Sibir'* took charge of seven of these and forged westward across the Laptev Sea. On the 24th *Lenin* and *Kapitan Nikolayev* were ploughing along some 130 km astern of this convey as they escorted the other four freighters. *Kapitan Dranitsyn* meanwhile had headed back east through the Ayon massif and started escorting another six freighters to the west.

By the 25th the last of the ships trapped off Kosa Dvukh Pilotov had been rescued, although it had taken *Leonid Brezhnev, Yermak* and *Admiral Makarov* more than two days to extricate the freighter *Amguyema*. She was jammed among ice that had been rafted and heaped up to a thickness of 30 m, and the three icebreakers had taken 12 hours simply to turn the freighter around. The convoluted tracks resulting from these and earlier maneuvers are clearly apparent on the Landsat image (Fig. 15) obtained from an orbiting NASA Landsat satellite on 24 October. This image is one of several portraying the progress of the rescue operations, interpreted by the "Quick-Look" program of the Geophysical Institute of the University of Alaska (Miller, 1983, 1984).

At this point *Kamensk-Ural'skiy, Urengoy* and *Pioner Rossii* were lying in the safe zone, under the protection of the icebreaker *Vladivostok.* The freighter *Okha* was lying only some 65 km away, while *Leningrad* and *Pioner Uzbekistana* were fighting their way north to the safe zone (Daygorodov and Martyshin, 1983f). Hopes of some improvement were pinned on the passage of an extensive cyclone at this point; it did raise temperatures briefly to as high as −3°C for a couple of days, but they soon plummeted again as the cold front came through (Loginov, 1983a). While *Admiral Makarov* refuelled and watered from *Okha, Leonid Brezhnev* and *Yermak*, their task in the area of Kosa Dvukh Pilotov completed, next began ploughing southwest to Mys Yakan, where the tanker *Igrim*

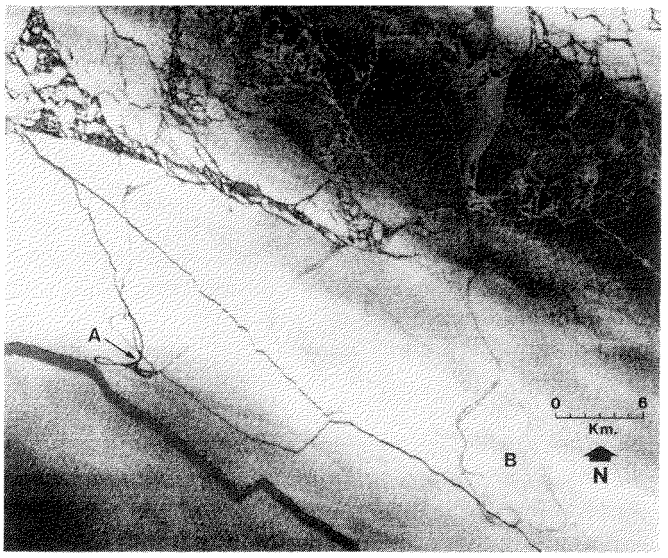

FIG. 15. Landsat image of the ice off Kosa Dvukh Pilotov, 24 October 1983. The convoluted ship tracks at A were made by *Leonid Brezhnev, Yermak*, and *Admiral Makarov* while freeing *Kamensk-Ural'skiy, Urengoy, Amguyema, Pioner Uzbekistana* and *Pioner Rossii* over the previous few days. Older tracks at B, already frozen over, were probably made during the rescue of such ships as *Borya Tsarikov, Yevgeniy Chaplanov, Vladimir Mordvinov* and *Pioner Kamchatki* some ten days earlier.

had been jammed against the fast ice by massive floes for three weeks (*Sovetskaya Rossiya*, 1983b; Loginov, 1983c). Farther west *Kapitan Dranitsyn*, attempting to fight her way through the Ayon massif with yet another convoy (consisting of six ships including the tanker *Yeniseysk* and the freighter *Khudozhnik S. Gerasimov*), had run into serious difficulties. Fortunately *Krasin*, newly arrived from the western Arctic, was able to come to the rescue (Loginov, 1983b; Gorbacheva and Zhityakov, 1983b). After two days adrift in the ice the convoy began forging west again (Loginov, 1983c; Daygorodov *et al.*, 1983). Meanwhile in Proliv Sannikova *Kapitan Nikolayev* had to call upon *Lenin* for assistance when she and her convoy became jammed and began drifting into shallow water.

News of an encouraging incident travelled rapidly throughout the eastern Arctic at about this time. The captain of the icebreaker *Leningrad* reported seeing walrus in a moonlit lead near his ship. This meant that leads and cracks were presumably still open all the way from the area of Kosa Dvukh Pilotov east to the open water in the Chukchi Sea (Gorbacheva and Zhityakov, 1983b).

On 26th October the convoys escorted by *Sibir'* and *Lenin*, which had again amalgamated to form a convoy of 15 ships (escorted in addition by *Kapitan Nikolayev* and *Murmansk*), were ploughing west across the Laptev Sea and had crossed the official boundary between the eastern and western Arctic, namely the 125°E meridian, which passes through the Lena delta (Loginov, 1983c). Meanwhile in Proliv Longa on that same date the *Noril'sk* class freighter *Monchegorsk* was making her way toward the convoy of ships that had been rescued from Kosa Dvukh Pilotov and was now lying in a safe zone of relatively loose ice, namely *Pioner Uzbekistana, Amguyema, Okha, Pioner Rossii* and the tankers *Urengoy* and *Kamensk-*

Ural'skiy. The icebreakers *Vladivostok*, *Leningrad* and *Kapitan Sorokin* were already standing by this convoy (Daygorodov *et al.*, 1983). *Leningrad* had lost some power due to malfunctions in two of her eight diesels, while *Pioner Uzbekistana* had had the lower half of her rudder torn off and the remainder of it badly bent. Having escorted *Kolya Myagotin* safely to Bukhta Provideniya, *Kapitan Khlebnikov* was now hurrying back west with supplies for her sister icebreakers (Balakirev, 1983b). By this stage *Leonid Brezhnev* and *Yermak* were within 36 km of *Igrim* near Mys Yakan; their plan was to break her loose and escort her east to join *Admiral Makarov*'s convoy. All of this activity was occurring against the background of the inexorable approach of winter; by the 26th the new ice in Bukhta Pevek had reached a thickness of 29 cm and was thickening at a rate of 6 cm per day (Sergeyev, 1983b).

The good news was received on 28 October that the massive convoy of 15 ships escorted by *Sibir'*, *Lenin*, *Murmansk* and *Kapitan Nikolayev* had safely negotiated Proliv Vil'kitskogo into the relatively easy conditions of the Kara Sea (Daygorodov and Martyshin, 1983g). The news from the vicinity of Ostrov Ayon was not so good, however. Despite *Krasin*'s powerful assistance, *Kapitan Dranitsyn* and her convoy of 6 ships was making only extremely slow progress through very heavy ice. Indeed progress was being annulled by an easterly ice drift with a speed of 2 knots.

A little farther east, near Mys Yakan, the news was better: *Leonid Brezhnev* and *Yermak* had succeeded in freeing *Igrim*. Farther east again, having transferred some of her cargo to *Pioner Rossii* and *Okha*, the damaged *Pioner Uzbekistana* had emerged from the eastern edge of the ice, escorted by the partly disabled *Leningrad*; both were now bound for Egvekinot.

In Proliv Longa *Admiral Makarov* and *Kapitan Sorokin* had led the tanker *Urengoy* north to a polynya off Mys Blossom at the southwest tip of Ostrov Vrangelya. Once *Leonid Brezhnev* had joined them the plan was to escort the tanker southwest to Pevek. Meanwhile the other five ships rescued from Kosa Dvukh Pilotov, now joined by *Igrim*, were lying adrift at the eastern edge of the ice in the Chukchi Sea, under the protection of *Kapitan Khlebnikov* and *Vladivostok*.

By the end of the month *Sibir'*, *Lenin*, *Murmansk* and *Kapitan Nikolayev* had safely reached Dikson with their convoy of 15 ships, and *Sibir'* and *Lenin* had again started back east, escorting the tanker *Samotlor*, bound from Arkhangel'sk to Pevek. They would, if necessary, assist *Krasin* and *Kapitan Dranitsyn*, which had now managed to free their convoy of 6 ships and were pushing west across the East Siberian Sea (Martyshin, 1983b). Having passed north of the Medvezh'iye Ostrova, they had set a course to round the north of the Novosibirskiye Ostrova; at last report on 31 October they had covered the respectable distance of 65 km in a four-hour watch.

In Proliv Longa *Leonid Brezhnev* and *Admiral Makarov*, escorting *Urengoy*, were making slow progress southwestward toward Pevek; in one 24-hour period they covered only 3 km (Loginov, 1983e). Meanwhile *Pioner Uzbekistana* had passed through Bering Strait and by 31 October was starting to unload at Egvekinot. *Yermak*, too, was heading out of the Arctic Ocean for repairs. It was decided that the damage she had suffered could not be tackled by her own divers among surging, heaving ice floes. Moreover at Bukhta Provideniya she could also call upon the port's own divers and all the facilities of the salvage tug *Bars* to help with the repairs (Loginov, 1983d). *Kapitan Khlebnikov* and *Igrim* were also eastward bound to Bering Strait and more hospitable waters.

On the night of 2 November the temperature dropped to −36°C at Pevek; by this time *Leonid Brezhnev* and *Admiral Makarov*, escorting *Urengoy*, were approaching Pevek; *Okha* and *Kapitan Sorokin* were still lying in the safe zone of the Mys Blossom polynya; and *Vladivostok*, with a further six ships, was lying at the eastern edge of the ice in the Chukchi Sea (Martyshin, 1983b). Reports from *Leonid Brezhnev* revealed something of the conditions under which she and her companion vessels were working. *Admiral Makarov* was towing *Urengoy* but the towline was repeatedly breaking in the heavy ice. Late in the evening of the 2nd *Urengoy* reached Pevek, and the little harbour icebreaker *Vasiliy Poyarkov* helped the big sea-going icebreakers to maneuver the tanker alongside. The first of the ships jammed for so long off Kosa Dvukh Pilotov had finally reached her destination. She and the icebreakers were given a tumultuous welcome by the crowds on the quayside. This was the latest date, by several weeks, on which any ship had reached Pevek (*Sotsialisticheskaya Industriya*, 1983). Having taken on fuel, supplies and water and once some repairs had been made to her towing gear, *Admiral Makarov*, escorted by *Leonid Brezhnev*, set off again on the 3rd, escorting the small icebreaker research vessel *Georgiy Sedov*, which had been quite badly damaged but had now been sufficiently repaired for her to put to sea again (Loginov, 1983e).

Off Mys Blossom *Okha* and *Monchegorsk* were waiting for *Leonid Brezhnev* and *Admiral Makarov* to return. Meanwhile, after hurried repairs *Yermak* was hurrying back west from Bukhta Provideniya to assist in escorting the remaining five ships to Pevek. Farther west *Krasin* and *Kapitan Dranitsyn*, escorting their convoy of six vessels around the north of the Novosibirskiye Ostrova, had crossed the 144° meridian, i.e., the meridian of Ostrov Faddeyevskiy, on 3 November (Loginov, 1983f). It was one of the ironies of the ice situation that conditions were easier along this northerly route than via either Proliv Sannikova or Proliv Lapteva farther south.

On the evening of 5 November, after the usual celebrations on the anniversary of the October Revolution, many of the celebrants in Pevek headed down to the harbour to welcome the freighter *Okha*, which had just arrived, escorted by *Leonid Brezhnev* and *Kapitan Sorokin*, and was mooring (Martyshin, 1983c). In her holds was a variety of freight transshipped from the damaged *Pioner Uzbekistana* and a number of other ships unable to tackle the severe ice conditions. Even before she arrived the Pevek longshoremen challenged her crew by radio to a competition with a view to discharging her cargo as rapidly as possible. After an extremely fast turn-around, *Leonid Brezhnev* and *Kapitan Sorokin* started back to the Mys

Blossom "refuge". Escorted by *Yermak* and *Vladivostok*, the tanker *Kamensk-Ural'skiy* and the freighters *Pioner Rossii*, *Monchegorsk* and *Amguyema* were also heading for the same destination from the ice edge to the east.

Well to the west, just as *Krasin* and *Kapitan Dranitsyn* had done, *Lenin* and *Sibir'*, escorting *Samotlor*, were rounding the Novosibirskiye Ostrova on the north. On 5 November they were off the northern tip of Ostrov Kotel'nyy and were making good progress; in one four-hour watch they covered 76 km.

Having rendezvoused with *Kamensk-Ural'skiy*, *Amguyema*, *Pioner Rossii* and *Monchegorsk* off Mys Blossom on 8 November, *Leonid Brezhnev*, *Yermak* and *Admiral Makarov* started back southwest with this convoy, bound for Pevek. Unfortunately a massive cyclone now swept into the area with gale-force winds that jammed the ice together (Daygorodov and Martyshin, 1983h). To complicate the situation further, the sun now disappeared for the last time for the winter. At the longitude of Mys Billingsa, some 195 km from Pevek, the convoy was brought to a complete stop in heavy ice under severe pressures.

Another convoy approaching Pevek from the other direction was also encountering difficulties due to severe ice pressures caused by this storm; *Sibir'* and *Krasin*, escorting *Samotlor*, were approaching Ostrov Ayon on the 8th but were making only 2-3 km per watch in heavy ice. In view of this general deterioration in conditions, *Lenin*, which had headed back west, was ordered to start east for Pevek once again.

On a more encouraging note, the icebreaker *Vladivostok*, towing the damaged *Georgiy Sedov*, had emerged through Bering Strait into the open waters of the Bering Sea. Meanwhile at Pevek the unloading of *Okha*'s cargo had been completed 12 hours ahead of schedule, and along with *Urengoy* the freighter was now awaiting the arrival of the final convoys (Daygorodov and Martyshin, 1983h).

The following ten days saw a remarkable change in the situation. By 19 November *Samotlor*, from the west, and all five ships from the east had reached Pevek safely and most had been unloaded and left again. Rather frustratingly the Soviet press coverage, so detailed with regard to the earlier phases of the crisis, now became extremely meagre. However the following can be established: *Lenin* set off westward, escorting *Monchegorsk*, and by 23 November was rounding the north side of Novosibirskiye Ostrova (Martyshin, 1983c). *Sibir'* had apparently first led two ships from Pevek to the safe zone off Mys Blossom, then returned for a second convoy. Assisted by *Leonid Brezhnev*, *Yermak*, *Admiral Makarov*, *Krasin* and one other icebreaker, she also escorted this convoy (*Amguyema*, *Okha* and *Urengoy*) safely northeast to Mys Blossom; here the first two ships joined the convoy and the combined force fought its way out to the edge of the heaviest ice (Martyshin, 1983c). From here *Admiral Makarov* and *Yermak* would be able to escort the convoy on their own; so once *Krasin* had bunkered from *Yermak*, the former ship, along with the two nuclear-powered icebreakers *Leonid Brezhnev* and *Sibir'* (which of course did not require to bunker) started back west.

Meanwhile the last ship to sail from Pevek, the tanker *Kamensk-Ural'skiy*, had put to sea, escorted by *Kapitan Sorokin*, and by 23 November the two ships had reached Mys Shelagskiy, where they awaited the arrival of the powerful team of *Sibir'*, *Leonid Brezhnev* and *Krasin*. Although it is not entirely clear from the Soviet press reports, Armstrong (1984) has suggested that, following *Lenin*'s lead, this final convoy also headed west. In that there were no later reports of the movements of these convoys, one may assume they all reached their destinations safely. Some indication of how long this may have taken is provided by a report from Vladivostok dated 10 December 1983 to the effect that *Admiral Makarov* had just returned to her home port.

CONTROL, ORGANIZATION AND SCIENTIFIC SUPPORT

The brunt of the task of monitoring and supervising the deployment and operations of icebreakers and ships throughout this crisis fell on the Marine Operations Headquarters for the eastern Arctic at Pevek, and especially on its head (Balakirev, 1983a). But a crisis of this magnitude inevitably also occupied the attention of senior officials in Moscow, and certainly the decision to transfer so many icebreakers from the west to the east had to be made in Moscow. However, the real measure of how serious the crisis was seen to be was that in early October a number of senior officials flew from Moscow to Pevek to be closer to the action; they included the head of *Glavflot*, the chairman of V/o "Moreplavaniye", and the head of *Administratsiya Sevmorputi* (Daygorodov and Martyshin, 1983b). All of these officials made frequent trips in the ice reconnaissance aircraft to keep themselves abreast of the rapidly changing situation (Solov'yev, 1983; Daygorodov and Martyshin, 1983d).

In Moscow at the *Minsterstvo Morskogo Flota* a temporary coordinating centre was set up under the deputy minister. Advising him were men such as the first deputy head of *Glavflot*, the deputy chairman of *Administratsiya Sevmorputi*, the chief state inspector for *Administratsiya Sevmorputi*, and the head of the *Gidrometeobyuro* of *Goskomgidromet* (Daygorodov and Martyshin, 1983b).

Operating from the Pevek headquarters was a group of weather and ice forecasters reporting to the head of the scientific operations group (Solov'yev, 1983). A parallel department handled ice-escorting operations. But given the crisis situation it was decided to bring in scientific reinforcements; on 19 October a group of meteorologists and hydrologists from the *Arkticheskiy i Antarkticheskiy Nauchno-Issledovatel'skiy Institut* left Leningrad for Pevek to provide some relief for their overburdened colleagues (Daygorodov and Martyshin, 1983d).

All these scientists relied on a number of sources for ice information. Apart from reports from the ships themselves and from ship-based hydrologists, a wider view of the situation was provided by regular reports from *Ilyushin 14* ice reconnaissance aircraft flown by the *Kolymo-Indigirskoye Aviapredpriyatiye* (Shmyganovskiy, 1983a). Finally, extensive use was made of satellite imagery, especially once winter darkness greatly limited the effectiveness of visual reconnaissances of various kinds. Particular use was made of images provided by

side-looking radar aboard the Cosmos 1500 ice-detection satellite, which, providentially, had been launched on 28 September 1983 (*Aerospace Daily*, 1984).

In view of this concentration of scientific expertise to resolve the crisis once it had developed, it is relevant to ponder the question of whether the severe ice conditions could not have been predicted. And indeed precisely this topic was raised by Ye. Tolstikov, deputy chairman of *Goskomitet SSSR po gidrometeorologii i kontrolyu prirodnoy sredy* (State Committee of the USSR on Hydrometeorology and Environmental Control) in an end-of-year "post mortem" on the crisis (Tolstikov, 1983). According to his assessment, while the six-month forecast issued by the scientists at AANII in March 1983, so critical for planning the coming season, had been seriously inaccurate, later corrections were remarkably accurate. Thus an amended forecast issued on 12 July stated that the Ayon massif was expected to be much more extensive than usual in August, while the up-date a month later, on 15 August, warned that during the last third of September this situation would be even worse and that the neighbouring Vrangel' massif would be six times larger than usual. Short-range forecasts of ice conditions were generally extremely accurate. Thus a 72-hour forecast issued on 2 October calling for a narrow shore lead to open from Mys Vankarem to Mys Shelagskiy during the period 3-5 October and to then close again was precise; a number of icebreakers and freighters were able to take good advantage of it.

But no matter how accurate these forecasts, the fact remained that cargoes had to reach their destinations and that icebound ships had to be extricated. At the same time the forecasts also gave grounds to assume there would be no dramatic improvement in conditions before the end of the season. It was, no doubt, this realization that dictated the major decision to transfer so many of the country's icebreaker fleet from the western to the eastern Arctic.

THE IMPACT AT PEVEK

The early closing of other Chukotka ports, such as Zelenyy Mys and Mys Shmidta, and the consequent diversion of freight bound for those ports to Pevek as the only port left operating in this part of the Arctic undoubtedly placed a considerable strain on Pevek's resources. Even the storage of all the extra freight, much of which was foodstuffs that could not stand freezing, posed problems. The *raykom* ordered all suitable buildings vacated for storage of the excess freight until the winter roads to Mys Shmidta, Bilibino and Zelenyy Mys had been established, probably in November or December, when the freight could be forwarded by truck. At one stage even the Pevek sports arena was commandeered (Gorbacheva and Zhityakov, 1983a). On 21 October alone the port received 14 000 tonnes of cargo destined for Mys Shmidta, Bilibino and Zelenyy Mys, all of which had to be stored (Kurasov, 1983).

In contrast to this problem of how to accommodate the surplus food, the local rumour-mill was predicting food shortages for the town and region; a rumour even began circulating to the effect that the town was to be evacuated (Sergeyev, 1983a). While food supplies seem to have been more than adequate, apparently there was a fuel shortage in Pevek in late August and some sort of rationing system was instituted. It was presumably for this reason that so much effort was later expended in escorting the tankers *Urengoy*, *Kamensk-Ural'skiy* and *Samotlor* to this port.

Despite the delays and confusion, by late November the minister for the Marine Fleet was able to make the statement that "practically all the cargoes", including building materials, equipment, fuel and provisions, had been delivered to Chukotka (Shmyganovskiy, 1983b). And on 10 December his ministry received a letter from the Ministry of Commerce (*Mintorgovli*) of the Russian Soviet Federated Socialist Republic expressing thanks and congratulations for having successfully delivered all the scheduled consumer goods, including potatoes, fresh fruit and vegetables to all points in the eastern Arctic (Martyshin, 1983d).

THE COST

This "success" had clearly been achieved at considerable cost. Apart from the loss of *Nina Sagaydak* and the massive damage to *Kolya Myagotin*, as has already been noted, a large number of other ships suffered varying degrees and types of damage. One early report put the number of damaged ships as being in excess of 30 (Bratchikov, 1983). The only consoling aspect of the entire situation was that there were no lives lost.

Perhaps equally costly, but for different reasons, was the disruption caused by the crisis. Presumably the transfer of so many of the country's most powerful icebreakers from their normal duties in the western Arctic must have led to postponement or cancellation of scheduled activities in the west. And even more disruptive must have been the re-routing of so many ships of the *Dal'nevostochnoye Parokhodstvo* west to Murmansk or Arkhangel'sk, rather than back through Proliv Longa and Bering Strait to their home ports in the Pacific. While in his appraisal of the situation the deputy minister of *Minmorflot*, A.V. Goldobenko, stressed the importance of finding appropriate cargoes for these ships as rapidly as possible for the long haul back from Arkhangel'sk, Murmansk or the Baltic to Vladivostok, whether by Suez or Panama (Martyshin, 1983d), inevitably this situation must have caused severe disruption in scheduled movements in the far east for the remainder of the winter.

With regard to the performance of individual ships, the nuclear-powered icebreakers (*Leonid Brezhnev*, *Sibir'* and *Lenin*) received extremely high praise; Goldobenko noted the launching of a fourth nuclear icebreaker, of comparable power to *Leonid Brezhnev* and *Sibir'*, on 2 November 1983 and stressed that it was essential to build even more such ships. The new *Noril'sk* (or SA-15) class of icebreaking freighters was also singled out for particular praise. Many of them were thrown straight into the fray in the eastern Arctic as soon as they were delivered from the Finnish yards where they were built. Capable of tackling ice 1-m thick independently, they commonly acted as icebreakers for less powerful ships. The ships of this class that played a major role in the crisis included *Arkhangel'sk*, *Bratsk*, *Igarka*, *Monchegorsk*, *Nizhneyansk* and

Okha. The successful performance of these ships in the 1983 crisis unquestionably played a role in the subsequent announcement by the Soviet Union that a further five ships of the class had been ordered from the Finnish state-owned Valmet shipyard (*Lloyds List*, 1984). This will bring the total number of these ships to 19.

POST-MORTEM

In his end-of-year assessment, Tolstikov made the very telling point that to send older, less powerful freighters into heavy ice astern of even the most powerful icebreaker was to court disaster (Tolstikov, 1983). He noted that both *Nina Sagaydak* and *Kolya Myagotin* (13 and 14 years old respectively) came into this category. Bratchikov (1983), a *Pravda* correspondent, had earlier made the same point, stressing that there were many such ships on arctic service operated by the *Dal'nevostochnoye Morskoye Parokhodstvo*; but he also pointed out that since many of the ports serviced by these ships on the north coast of Chukotka were either too shallow or too difficult of access for larger vessels such as the new *Noril'sk* class ships there was still a need for small ships.

Bratchikov also pointed out that in terms of organization of arctic shipping there was a great deal of unnecessary duplication and confusion due to widespread overlapping jurisdictions among ministries. He suggested that a "brain centre" was required — i.e., an organization such as *Glavsevmorput'* (Chief Administration of the Northern Sea Route) had once been — with a blanket responsibility for every aspect of arctic shipping. *Glavsevmorput'* was abolished in the sixties. There has been no official mention of its possible resurrection.

One area of possible improvement of support services recommended by the minister for the Marine Fleet, Guzhenko (Shmyganovskiy, 1983b), and by his deputy, Goldobenko (Martyshin, 1983d), was the need for year-round ice reconnaissance. Clearly this poses real problems with regard to the dark period, but presumably greater use might be made of satellite imagery.

On one topic almost every analyst was agreed: that much of the blame lay with the shippers of the various cargoes (Shmyganovskiy, 1983a, 1983b; Solov'yev, 1983; Bratchikov, 1983; Martyshin, 1983e). In many cases freight bound for the Arctic reached the port of departure extremely late. Thus Goldobenko reported that whereas arctic freight was supposed to reach Vladivostok, Nakhodka or Vanino no later than 10 August, the last shipment of cement reached Vladivostok at the end of August (Martyshin, 1983d). In a similar vein Guzhenko (Shmyganovskiy, 1983b) pointed out that the last tanker had left Nakhodka for the Arctic on 21 September, rather than its scheduled sailing date of 22 August.

The analysts were equally unanimous as to the delays and damage caused by inadequate or inappropriate packaging of freight. Guzhenko noted that only 49 per cent of the freight involved was in containers or acceptable packaging as specified by government standards (Shmyganovskiy, 1983b). This meant that an inordinate amount of time was wasted in freight handling and that there was excessive spoilage when freight had to sit outdoors in the Arctic.

The stated long-range goal of *Minmorflot* (Armstrong, 1984) is for year-round operations along the entire Northern Sea Route, although this goal is not expected to be attained before 1990. When Guzhenko was asked how the problems of the 1983 season in the eastern Arctic would affect this long-range goal (Martyshin, 1983d), he still maintained that it could be achieved. However, he did confess that it would take time, money and the application of new technology.

POSTSCRIPT

The 1983 crisis has clearly provoked some major changes in *Minmorflot*'s long-range plans for the Northern Sea Route (Shabad, 1984). Some of the older smaller vessels are to be retired from arctic service and replaced by ships of the *Noril'sk* (SA-15) class. Since they are too large to enter many smaller arctic ports, the plan is for them to serve only two major ports in the eastern Arctic, namely Tiksi and Pevek; the freight will there be transshipped to smaller coastal vessels for distribution to smaller ports. Pevek is already capable of operating as such a break-bulk point, but Tiksi will require further dredging to accommodate the large SA-15 ships at a newly completed deepwater pier.

Another proposed strategy aimed at taking maximum advantage of the short ice-free season is that more ships will winter in arctic ports so that they can begin local operations as soon as ice conditions permit. But for this strategy to be effective additional service facilities, supplies and fuel will have to be provided at arctic ports such as Pevek and Zelenyy Mys, where it is proposed that these ships will winter (Shabad, 1984).

Several developments during 1984 indicate that some remedial measures have already been put into effect. During the very first week of the year the icebreaker *Vladivostok* escorted the freighter *Kapitan Markov* through the ice of Zaliv Kresta to the port of Egvekinot (*Izvestiya*, 1984a). The first winter voyage of Egvekinot had occurred only the previous year, when the icebreaker *Admiral Makarov* (Fig. 16) had escorted *Kapitan Markov*'s sister-ship *Vasiliy Fedoseyev* into Egvekinot

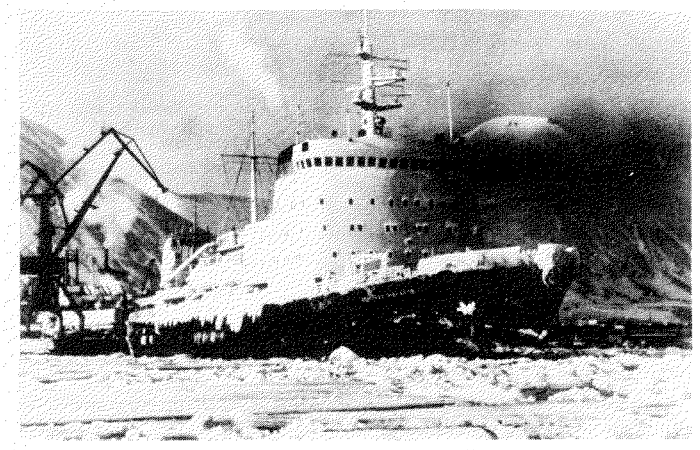

FIG. 16. *Admiral Makarov*. (Photo: E.A. Wilson collection)

on 8 February 1983 with a cargo of mining equipment, prefabricated arctic houses and other supplies bound for Iul'tin, the centre for a tin and tungsten mining complex in the interior of northern Chukotka (Shabad, 1983).

During the post-mortems over the crisis in the eastern Arctic in the closing weeks of 1983 there had been several calls for greater winter use of Egvekinot and of the winter road from Iul'tin to Mys Shmidta. Although there has been no official confirmation that this was the object of *Kapitan Markov*'s voyage, it seems probable that her cargo may have contained items bound for Mys Shmidta as substitutes for items it had been impossible to deliver during the 1983 season.

Another theme to emerge from the post-mortems was that greater emphasis should be placed on supplying the eastern sector of the Arctic from the west. To demonstrate the feasibility of this, the 1984 summer shipping season was inaugurated by an unusually early voyage by *Leonid Brezhnev*, escorting the *Noril'sk*-class freighter *Monchegorsk*. They sailed from Murmansk on 3 June and reached Pevek on 25 June, some 40 days prior to the usual start of operations at that port (Shabad, 1984). It is interesting to note that *Monchegorsk* (completed only in 1983) was awaiting repairs at the Wärtsilä yards in Turku (Finland) in September 1984 (Dr. Brenton Barr, pers. comm. 1984). This would suggest that she had not emerged unscathed from the early through-passage to Pevek.

A final remedial measure that has been attempted is the use of the brand-new LASH ship *Aleksey Kosygin*. Completed only in December 1983, she sailed from Vladivostok in July 1984 (*Pravda*, 1984). She was carrying a cargo of 82 loaded lighters stacked in six rows; the lighters can be launched and retrieved from alongside by a travelling gantry crane, which can travel the full length of the ship from bridge to stern. She was to deliver her lighters to a range of ports as far north as Chukotka. It is planned that these will normally include Egvekinot, Pevek and Zelenyy Mys, although it is not known if she reached the mouth of the Kolyma on her maiden voyage; however *Izvestiya* (1984b) indicated that she did indeed reach Chukotka. The rationale behind the use of this innovative vessel is that while *Aleksey Kosygin* is capable of tackling ice conditions likely to arise at sea, by offloading her lighters while lying off smaller ports (or even settlements without harbours) she can service almost any port on the arctic littoral. This is perhaps the most interesting of the innovations to emerge from the 1983 crisis.

APPENDIX: Technical Specifications of the Ships Involved

Name	Where built	Date completed	Tonnage dwt.	Tonnage gross	Tonnage net	Dimensions (m)	Engines	Speed (knots)
ICEBREAKERS								
A. Nuclear-powered								
Leonid Brezhnev (formerly *Arktika*)	Baltiyskiy, Leningrad	1974	4096	18 172	3018	147.99 x 30.00	2 reactors, 4 Kirov steam turbines (75 000 hp), 3 generators, 3 shafts	21
Sibir'	Baltiyskiy, Leningrad	1977	4096	18 172	3018	147.99 x 30.00	2 reactors, 4 Kirov steam turbines, (75 000 hp), 3 generators, 3 shafts	21
Lenin	Admiralteyskiy, Leningrad	1959	3849	14 067	2820	134.02 x 27.64	3 reactors, 4 steam turbines (44 000 hp), 4 generators, 3 shafts	18
B. Conventionally powered								
Yermak	Oy Wärtsilä A/B, Helsinki	1973	7560	12 231	—	135.01 x 26.07	9 x 12 cyl. Wärtsilä/ Sulzer diesels (41 400 hp), 9 generators, 3 shafts	19
Admiral Makarov	Oy Wärtsilä A/B, Helsinki	1975	7560	12 231	—	135.01 x 26.07	9 x 12 cyl. Wärtsilä/ Sulzer diesels (41 400 hp), 9 generators, 3 shafts	19
Krasin	Oy Wärtsilä A/B, Helsinki	1976	7560	12 231	—	135.01 x 26.07	9 x 12 cyl. Wärtsilä/ Sulzer diesels (41 400 hp), 9 generators, 3 shafts	19
Leningrad	Oy Wärtsilä A/B, Helsinki	1961	5609	9427	1142	122.23 x 24.59	8 x 9 cyl. diesels (26 000 hp), 8 generators, 4 elec. motors, 3 shafts	18.25
Murmansk	Oy Wärtsilä A/B, Helsinki	1968	5609	9427	1142	122.23 x 24.59	8 x 9 cyl. diesels (26 000 hp), 8 generators, 4 elec. motors, 3 shafts	18.25

(continued)

APPENDIX: Technical Specifications of the Ships Involved (continued)

Name	Where built	Date completed	Tonnage dwt.	Tonnage gross	Tonnage net	Dimensions (m)	Engines	Speed (knots)
Vladivostok	Oy Wärtsilä A/B, Helsinki	1968	5609	9427	1142	122.23 x 24.59	8 x 9 cyl. diesels (26 000 hp), 8 generators, 4 elec. motors, 3 shafts	18.25
Kapitan Sorokin	Oy Wärtsilä A/B, Helsinki	1977	4225	10 609	2668	131.88 x 26.70	6 x 9 cyl. Wärtsilä/ Sulzer diesels (22 000 hp), 6 generators, 3 elec. motors, 3 shafts	19
Kapitan Nikolayev	Oy Wärtsilä A/B, Helsinki	1977	4225	10 609	2668	131.88 x 26.70	6 x 9 cyl. Wärtsilä/ Sulzer diesels (22 000 hp), 6 generators, 3 elec. motors, 3 shafts	19
Kapitan Dranitsyn	Oy Wärtsilä A/B, Helsinki	1977	4225	10 609	2668	131.88 x 26.70	6 x 9 cyl. Wärtsilä/ Sulzer diesels (22 000 hp), 6 generators, 3 elec. motors, 3 shafts	19
Kapitan Khlebnikov	Oy Wärtsilä A/B, Helsinki	1977	4225	10 609	2668	131.88 x 26.70	6 x 9 cyl. Wärtsilä/ Sulzer diesels (22 000 hp), 6 generators, 3 elec. motors, 3 shafts	19
Magadan	Oy Wärtsilä A/B, Helsinki	1982	—	4409	—	88.6 x 21.2	4 Wärtsilä/Vasa diesels (12 400 hp), 2 shafts	16.5
Dikson	Oy Wärtsilä A/B, Helsinki	1983	—	4409	—	88.6 x 21.2	4 Wärtsilä/Vasa diesels (12 400 hp), 2 shafts	16.5
Vasiliy Poyarkov	Admiralteyskiy, Leningrad	1963	1141	2305	—	68.48 x 18.09	3 diesels (5400 hp), 3 generators, 3 shafts	14
Georgiy Sedov	Admiralteyskiy, Leningrad	1967	1141	2305	—	68.48 x 18.09	3 diesels (5400 hp), 3 generators, 3 shafts	14
ICEBREAKING FREIGHTERS								
SA-15 class								
Arkhangelsk	Valmet, Helsinki	1982	19 500	—	—	176.9 x 24.5	2 Wärtsilä Sulzer, 14ZV 40/48 diesels	17
Bratsk	Valmet, Helsinki	1982	19 500	—	—	176.9 x 24.5	2 Wärtsilä Sulzer, 14ZV 40/48 diesels	17
Monchegorsk	Wärtsilä, Helsinki	1983	19 500	—	—	176.9 x 24.5	2 Wärtsilä Sulzer, 14ZV 40/48 diesels	17
Nizhneyansk	Wärtsilä, Helsinki	1983	19 500	—	—	176.9 x 24.5	2 Wärtsilä Sulzer, 14ZV 40/48 diesels	17
Okha	Wärtsilä, Helsinki	1983	19 500	—	—	176.9 x 24.5	2 Wärtsilä Sulzer, 14ZV 40/48 diesels	17
OTHERS								
Amguyema	Leninskogo Komsomola, Komsomolsk	1962	8700	8181	3477	133.1 x 18.9	4 x 10 cyl. diesels (7200 hp), 4 generators, 4 elec. motors	15
Kapitan Gotskiy	Leninskogo Komsomola, Komsomolsk	1965	8700	8181	3477	133.1 x 18.9	4 x 10 cyl. diesels (7200 hp), 4 generators, 4 elec. motors	15
Vankarem	Leninskogo Komsomola, Komsomolsk	1966	8700	8181	3477	133.1 x 18.9	4 x 10 cyl. diesels (7200 hp), 4 generators, 4 elec. motors	15
Kapitan Markov	Leninskogo Komsomola, Komsomolsk	1968	8700	8181	3477	133.1 x 18.9	4 x 10 cyl. diesels (7200 hp), 4 generators, 4 elec. motors	15
Vasiliy Fedoseyev	Leninskogo Komsomola, Komsomolsk	1969	8700	8181	3477	133.1 x 18.9	4 x 10 cyl. diesels (7200 hp), 4 generators, 4 elec. motors	15
Kapitan Kondrat'yev	Leninskogo Komsomola, Komsomolsk	1972	8700	8181	3477	133.1 x 18.9	4 x 10 cyl. diesels (7200 hp), 4 generators, 4 elec. motors	15

(continued)

APPENDIX: Technical Specifications of the Ships Involved (continued)

Name	Where built	Date completed	Tonnage dwt.	Tonnage gross	Tonnage net	Dimensions (m)	Engines	Speed (knots)
DRY CARGO SHIPS								
Pioner Chukotki	Vyborg, Vyborg	1975	6109	4814	2065	130.31 x 17.02	Sulzer 5 cyl. Bransk (5500 hp)	15.5
Pioner Kamchatki	Vyborg, Vyborg	1976	6109	4814	2065	130.31 x 17.02	Sulzer 5 cyl. Bransk (5500 hp)	15.5
Pioner Rossii	Vyborg, Vyborg	1976	6109	4814	2065	130.31 x 17.02	Sulzer 5 cyl. Bransk (5500 hp)	15.5
Pioner Uzbekistana	Vyborg, Vyborg	1980	6109	4814	2065	130.31 x 17.02	Sulzer 5 cyl. Bransk (5500 hp)	15.5
Fedor Okhlopkov	Navashinsk, Navashino	1974	4150	3587	1740	123.53 x 15.02	2 x 8 cyl. Russkiy (2000 hp), 2 shafts	11.25
Isidor Barakhov	Navashinsk, Navashino	1974	4150	3587	1740	123.53 x 15.02	2 x 8 cyl. Russkiy (2000 hp), 2 shafts	11.25
Maksim Ammosov	Navashinsk, Navashino	1975	4150	3587	1740	123.53 x 15.02	2 x 8 cyl. Russkiy (2000 hp), 2 shafts	11.25
Vasiliy Yan	Navashinsk, Navashino	1976	4150	3587	1740	123.53 x 15.02	2 x 8 cyl. Russkiy (2000 hp), 2 shafts	11.25
Khudozhnik S. Gerasimov	"61 Kommunar" Nikolayev	1968	4291	5120	2196	130.94 x 16.87	4 x 10 cyl. diesels (7200 hp), 4 generators, 4 elec. motors	16.5
Galya Komleva	Neptun, Rostock	1969	4638	3411	1631	105.7 x 15.65	MAN 6 cyl. Halberstadt (3250 hp)	13.75
Kolya Myagotin	Neptun, Rostock	1969	4638	3411	1631	105.7 x 15.65	MAN 6 cyl. Halberstadt (3250 hp)	13.75
Nina Sagaydak	Neptun, Rostock	1970	4638	3411	1631	105.7 x 15.65	MAN 6 cyl. Halberstadt (3250 hp)	13.75
Tolya Shumov	Neptun, Rostock	1970	4638	3411	1631	105.7 x 15.65	MAN 6 cyl. Halberstadt (3250 hp)	13.75
Borya Tsarikov	Neptun, Rostock	1971	4638	3411	1631	105.7 x 15.65	MAN 6 cyl. Halberstadt (3250 hp)	13.75
Vitya Sinitsa	Neptun, Rostock	1971	4638	3411	1631	105.7 x 15.65	MAN 6 cyl. Halberstadt (3250 hp)	13.75
Vladimir Mordvinov	Stocznia Gdanska, Gdansk	1973	14 000	10 158	5758	150.27 x 21.06	Sulzer 6 cyl. Cegielskiy (9600 hp)	15
Konstantin Petrovskiy	Stocznia Gdanska, Gdansk	1974	14 000	10 158	5758	150.27 x 21.06	Sulzer 6 cyl. Cegielskiy (9600 hp)	15
Kapitan Samoylenko	Stocznia Gdanska, Gdansk	1975	14 000	10 158	5758	150.27 x 21.06	Sulzer 6 cyl. Cegielskiy (9600 hp)	15
Komiles	Stocznia Gdanska, Gdansk	1960	5694	4590	2315	123.88 x 16.74	5 cyl. Sulzer (4500 hp)	14
Baykonur	Stocznia Gdanska Gdansk	1967	6035	4519	2344	123.88 x 16.74	5 cyl. (5450 hp)	16
Anton Buyukly	Santierul Naval, Galatz	1969	4230	3019	1412	104.5 x 14.41	B & W 5 cyl. Bransk (2900 hp)	13.5
Yevgeniy Chaplanov	Santierul Naval, Galatz	1970	4230	3019	1412	104.5 x 14.41	B & W 5 cyl. Bransk (2900 hp)	13.5
TANKERS								
Samotlor	Rauman Telakka Rauman-Repola O/Y, Rauma	1975	14 500	12 196	6639	160.00 x 23.07	B & W 5 cyl. Bransk (11 000 hp)	16.25
Urengoy	Rauman Telakka Rauman-Repola O/Y, Rauma	1975	14 500	12 196	6639	160.00 x 23.07	B & W 5 cyl. Bransk (11 000 hp)	16.25
Berezovo	Rauman Telakka Rauman-Repola O/Y, Rauma	1976	14 500	12 196	6639	160.00 x 23.07	B & W 5 cyl. Bransk (11 000 hp)	16.25
Nizhnevartovsk	Rauman Telakka Rauman-Repola O/Y, Rauma	1976	14 500	12 196	6639	160.00 x 23.07	B & W 5 cyl. Bransk (11 000 hp)	16.25

(continued)

APPENDIX: Technical Specifications of the Ships Involved (concluded)

Name	Where built	Date completed	Tonnage dwt.	Tonnage gross	Tonnage net	Dimensions (m)	Engines	Speed (knots)
Usinsk	Rauman Telakka Rauman-Repola O/Y, Rauma	1976	14 500	12 196	6639	160.00 x 23.07	B & W 5 cyl. Bransk (11 000 hp)	16.25
Kamensk-Ural'skiy	Rauman Telakka Rauman-Repola O/Y, Rauma	1977	14 500	12 196	6639	160.00 x 23.07	B & W 5 cyl. Bransk (11 000 hp)	16.25
Yeniseysk	Rauman Telakka Rauman-Repola O/Y, Rauma	1977	14 500	12 196	6639	160.00 x 23.07	B & W 5 cyl. Bransk (11 000 hp)	16.25
Igrim	Rauman Telakka Rauman-Repola O/Y, Rauma	1978	14 500	12 196	6639	160.00 x 23.07	B & W 5 cyl. Bransk (11 000 hp)	16.25

Sources: Bock and Bock, 1977; Curtis and Greenway, 1981.

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