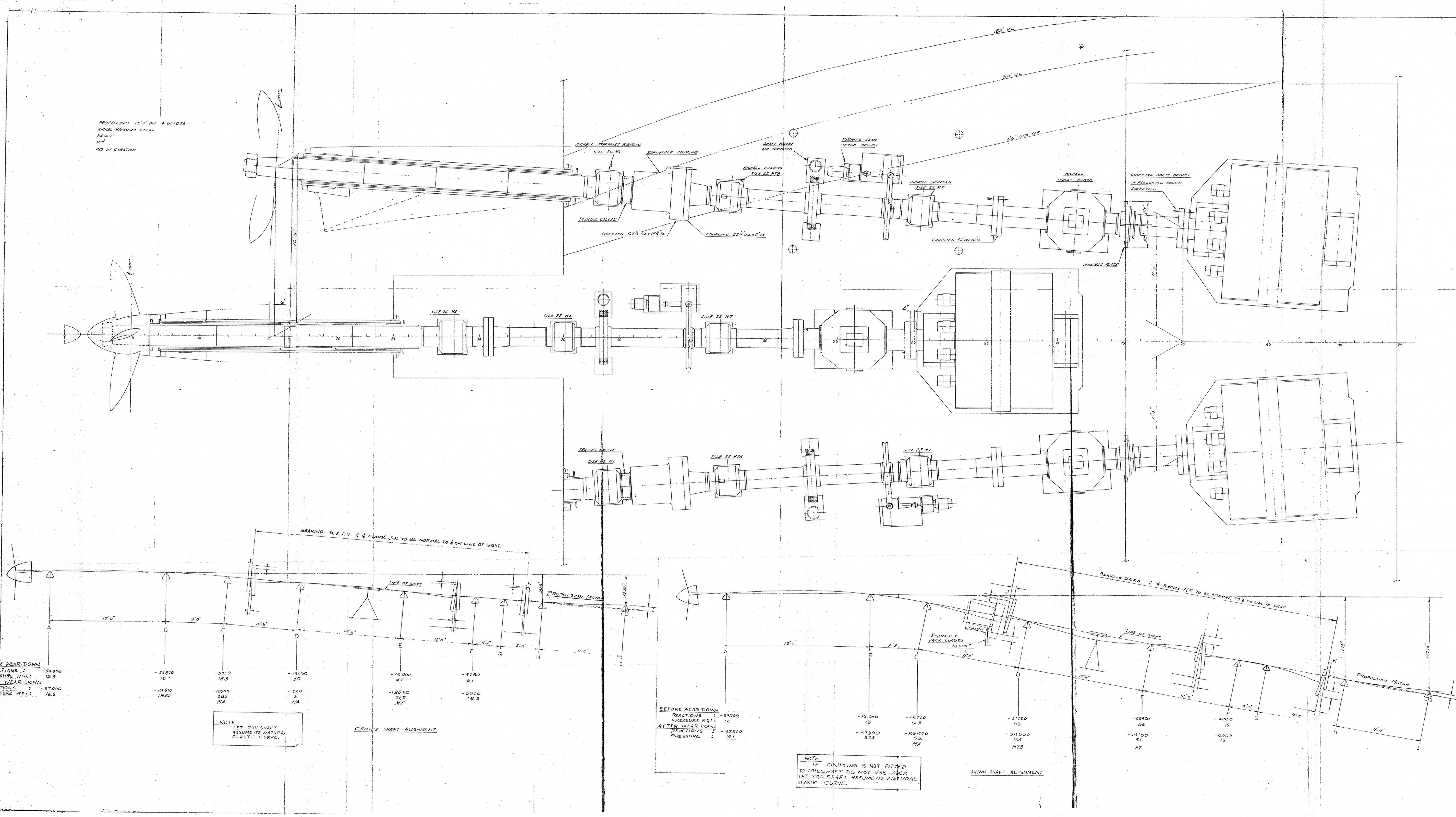

SHAFTING CALCULATIONS

8000 S.H.P. BOLLARD R.P.M. 133 OPEN WATER 180 R.P.M.
9000 S.H.P. BOLLARD R.P.M. 139 OPEN WATER 184 R.P.M.

CALCULATION PER LLOYDS

INTERMEDIATE SHAFT DIA. = $3.5\sqrt[3]{\frac{S.H.P}{R}}$

8000 @ 133	8000 @ 180	9000 @ 139	9000 @ 184
$3.5\sqrt[3]{\frac{8000}{133}}$	$3.5\sqrt[3]{\frac{8000}{180}}$	$3.5\sqrt[3]{\frac{9000}{139}}$	$3.5\sqrt[3]{\frac{9000}{184}}$
$3.5\sqrt[3]{60.3}$	$3.5\sqrt[3]{44.5}$	$3.5\sqrt[3]{64.7}$	$3.5\sqrt[3]{48.9}$
3.5 x 3.925	3.5 x 3.545	3.5 x 4.01	3.5 x 3.66
13.73" DIA.	12.41" DIA.	14.05" DIA.	12.82" DIA.
THRUST SHAFT DIA.			
13.73 x 1.15	12.41 x 1.15	14.05 x 1.15	12.82 x 1.15
15.79" DIA.	14.27" DIA	16.16" DIA.	14.74" DIA
SCREW SHAFT DIA. $1.14d + \frac{P}{C} = 1.14d + \frac{15 \times 12}{144} = 1.14d + 1.25$			
(13.73 x 1.14) + 1.25	(12.4 x 1.14) + 1.25	(14.05 x 1.14) + 1.25	(12.82 x 1.14) + 1.25
16.9" DIA.	15.4" DIA.	17.27" DIA.	15.87" DIA.
STRENGTHENING FOR ICE TO LLOYDS CLASS I			
INTERMEDIATE SHAFT 8% ON DIA.			
13.73 x 1.08	12.41 x 1.08	14.05 x 1.08	12.82 x 1.08
14.83" DIA.	13.4" DIA	15.175" DIA	13.85" DIA.
THRUST SHAFT 8% ON DIA.			
15.79 x 1.08	14.27 x 1.08	16.16 x 1.08	14.74 x 1.08
17.05" DIA.	15.41" DIA.	17.45" DIA.	16.92" DIA
SCREW SHAFT 15% ON DIA.			
16.9 x 1.15	15.4 x 1.15	17.27 x 1.15	15.87 x 1.15
19.44" DIA.	17.71" DIA.	19.86" DIA.	18.25" DIA.
OVERSTRENGTH PER D.O.T. SPEC.			
INTERMEDIATE SHAFT 135% OVERSTRENGTH			
$\sqrt[3]{14.83^3 \times 2.35}$	$\sqrt[3]{13.4^3 \times 2.35}$	$\sqrt[3]{15.18^3 \times 2.35}$	$\sqrt[3]{13.85^3 \times 2.35}$
$\sqrt[3]{7700}$	$\sqrt[3]{5660}$	$\sqrt[3]{8230}$	$\sqrt[3]{6250}$
19.75" DIA.	17.82" DIA.	20.2" DIA.	18.42" DIA.
THRUST SHAFT 135% OVERSTRENGTH			
$\sqrt[3]{17.05^3 \times 2.35}$	$\sqrt[3]{15.41^3 \times 2.35}$	$\sqrt[3]{17.45^3 \times 2.35}$	$\sqrt[3]{16.92^3 \times 2.35}$
$\sqrt[3]{11680}$	$\sqrt[3]{8630}$	$\sqrt[3]{12500}$	$\sqrt[3]{11410}$
22.68" DIA.	20.52" DIA.	23.2" DIA.	22.5" DIA.
SCREW SHAFT 100% OVERSTRENGTH			
$\sqrt[3]{19.44^3 \times 2}$	$\sqrt[3]{17.71^3 \times 2}$	$\sqrt[3]{19.86^3 \times 2}$	$\sqrt[3]{18.25^3 \times 2}$
$\sqrt[3]{14750}$	$\sqrt[3]{11180}$	$\sqrt[3]{15650}$	$\sqrt[3]{12200}$
24.5" DIA.	22.3" DIA.	25" DIA.	23" DIA

MIN. SIZES DICTATED BY D.O.T. SPEC. ÷

INTERMEDIATE SHAFT - 21.8" DIA.
THRUST SHAFT - 24" DIA.
SCREW SHAFT - 24.8" DIA.

MIN. DIAMETERS USED ÷

INTERMEDIATE SHAFT - 21 7/8" DIA.
THRUST SHAFT - 24 1/8" DIA.
SCREW SHAFT - 25 1/8" DIA.

CENTRE SHAFT RAKE ÷

VERTICAL = .3424"/12"

WING SHAFT RAKES ÷

VERTICAL = .3418"/12"
HORIZONTAL = .7780"/12"

SCREW SHAFT LINER THICKNESS TO LLOYDS ÷

$\frac{D+9}{32} = T \quad \frac{25.125+9}{32} = 1.0664"$

1.0664 + .125 = 1.1914" MADE 1 7/32" MIN.
THICKNESS OF LINER BETWEEN STERN BUSHES = 1.1914 x .75 = .894" MADE 29/32" MIN.
SHAFTS ARE INCREASED 1/8" ON DIA. IN WAY OF BEARINGS.

MIN. LENGTH OF STERNTUBE BUSHES ÷

AFT. BUSH = [25 1/8" + (1 7/32 x 2)] x 5 = 137.8125" MADE 140"
FWD. BUSH = [25 1/8" + (1 7/32" x 2)] x 2 = 55.125" MADE 57"

COUPLING FLANGE THICKNESS ÷

21.875 x .27 = 5.9" MADE 6" THICK
FILLETS = 2 1/4" RAD.

COUPLING BOLTS DIA. ÷

$.6\sqrt{\frac{21.875^3}{14 \times 19.5}} = .6\sqrt{38.46} = 3.72"$ DIA. MADE 3 3/4" DIA.

WING REMOVABLE COUPLING BOLT SIZES ÷

$.6\sqrt{\frac{21.875^3}{12 \times 28.4375}} = .6\sqrt{30.8} = 3.33"$ DIA. MADE 3 3/8" DIA.

LIST OF EQUIPMENT	REFERENCE DWGS.
2 WING PROPELLERS + 2 SPARES	MA-286-129
2 WING STERNTUBES	MA-286-121
2 WING SCREW SHAFTS + 1 SPARE	MA-286-108
2 WING REMOVABLE COUPLINGS	MA-286-108
2 WING INTERMEDIATE SHAFTS	MA-286-108
2 WING THRUST SHAFTS	MA-286-108
1 CENTRE PROPELLER + 1 SPARE	MA-286-130
1 CENTRE STERNTUBE	MA-286-120
1 CENTRE SCREW SHAFT + 1 SPARE	MA-286-107
1 CENTRE INTERMEDIATE SHAFT	MA-286-107
1 CENTRE THRUST SHAFT	MA-286-107
3 MICHELL AFTERMOST BEARINGS	SIZE 26
6 MICHELL TUNNEL BEARINGS	SIZE 22
3 MICHELL THRUST BLOCKS	MPR-286-1550
3 C.G.E. PROPULSION MOTORS 9000 SHP EACH	MPR-286-1003
3 SHAFT TURNING GEARS	MA-286-138
3 SHAFT BRAKES	MPR-286-
3 BULKHEAD STUFFING BOXES	MA-286-146
SPANNERS FOR COUPLING NUTS, STERNTUBE & TAILSHAFT NUTS	MA-286-109

MARK	PARTICULARS	DATE
5	SHEET 2 ALTERED FROM LETTER 25-5-66	31-5-66
4	SHEET 2 ALTERED	MAY 9-66
3	STARBD TURNING GEAR MOVED OUTBOARD OF SHAFT	JAN 21-66
2	ALIGNMENT ADDED	MAY 3-65
1	WING SHAFT AFT TUNNEL BEARING RELOCATED	MAR 29-65

REVISIONS

APPROVALS		
	DATE	
OWNERS	DATE	APR. 29-65
C.S.I.	DATE	MAR. 24-65
LLOYDS	DATE	MAR. 16-65

CANADIAN VICKERS SHIPYARDS
LIMITED
MONTREAL, CANADA
246 MARINE ENGINEERING DIVISION

ARRANGEMENT OF SHAFTING

ARTIC PATROL ICEBREAKER

DRAWN E. MacCULLION	DATE MAR. 4-65	SCALE 3/8" = 1'-0"
CHECKED M. H. RILEY	DATE 17/6/65	CHIEF DRAUGHTSMAN
1st SHOP ISSUE	DATE	CHIEF ESTIMATOR
CHARGE No. 286-397		APPROVED

C.C.G.S. LOUIS S. ST-LAURENT