

The World's Oldest Aircraft Propeller Manufacturer

# Flottorp



**SERVICE  
MANUAL**

**MODEL FM  
FIXED - PITCH  
PROPELLER**

*Flottorp*

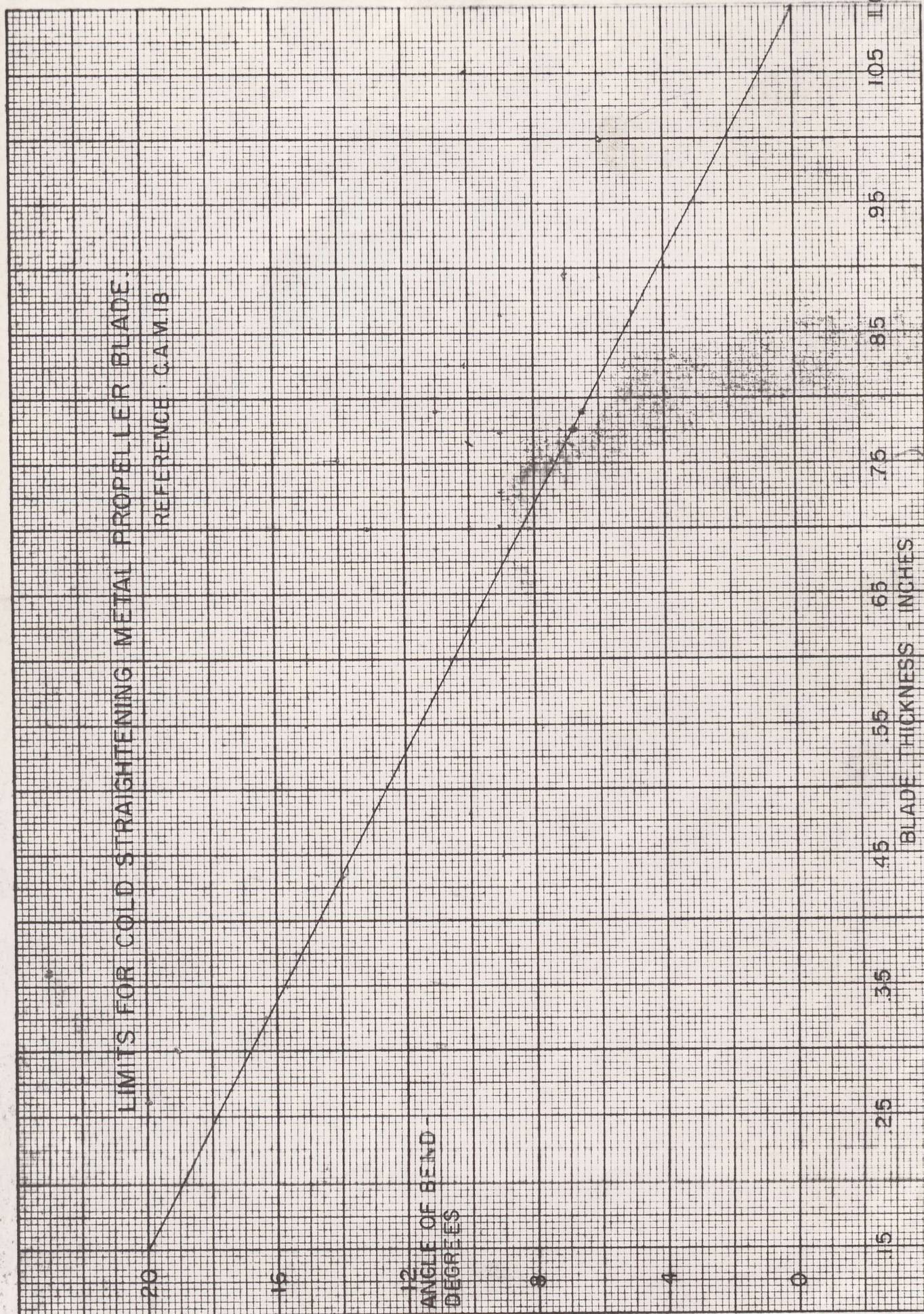
**MANUFACTURING COMPANY**

INTERNATIONAL AIRPORT

ST. PETERSBURG, 32, FLORIDA

# LIMITS FOR COLD STRAIGHTENING METAL PROPELLER BLADE.

REFERENCE : C.A.M. 18



## SERVICE MANUAL

### Model F1 Fixed-Pitch Propellers

#### INTRODUCTION

This manual contains routine inspection, maintenance, overhaul, and minor repair procedures which can be accomplished by propeller servicing facilities. These instructions are intended to supplement the criteria set forth in Civil Air Regulations Part 18 and Civil Aeronautics Manual 18. In no case are they to be construed or interpreted as overriding or contradictory to the material in the regulations or manual.

The use of this manual by any propeller servicing facility shall not, under any circumstances be interpreted or construed as an approval of the facility by Flottorp Manufacturing Company.

This manual revised September 26, 1962, and the following addenda have been approved by the FAA.

FAA Approved

*Walter P. Haldeman*

Approval Signature

Chief, Engr. & Mfg. Branch

October 4, 1962

Approval Date

## TABLE OF CONTENTS

	Page
SECTION I -- Specifications and Description.....	3
A. General Specifications.....	3
B. Installations.....	3
SECTION II -- Service Tools and Equipment.....	3
SECTION III - Periodic Inspection .....	4
SECTION IV -- Maintenance and Repair .....	4
A. Propeller Installation, 0-320-D2B Engine .....	4
B. Propeller Removal, 0-320-D2B Engine .....	5
C. Cleaning .....	5
D. Inspection .....	6
E. Repairs .....	6
F. Checking Propeller Track in Shop	7
G. Checking Propeller Track on the Aircraft .....	7
H. Painting .....	7
I. Balancing .....	8
SECTION V-- Parts List .....	9

## SECTION I

### SPECIFICATIONS AND DESCRIPTION

#### A. General Specifications

Type	Fixed-Pitch
Material	Aluminum Alloy
Engine Shaft	SAE Flanged
	AS 127 No. 2
Pitch Range	50 in. to 70 in.
Weight	30.5 lb.

#### B. Installations

<u>Aircraft</u>	<u>Engine</u>	<u>Rating</u>	<u>Propeller Model</u>	<u>Propeller Diameter</u>	
				<u>Max.</u>	<u>Min.</u>
Beech Musketeer 23	Lycoming O-320-D2B	160 HP 2700 RPM	F1C 7660-2	74	74

## SECTION II

### SERVICE TOOLS AND EQUIPMENT

No special tools are required for maintenance and overhaul of these propellers. Standard equipment necessary is:

Propeller Assembly Table  
Suspension Type Propeller Balancer

September 26, 1962

### SECTION III

#### PERIODIC INSPECTION

NATURE OF INSPECTION	INSPECTION TIME
Security of mounting and mounting bolts safetied	Postflight
Minor nicks, scratches, and cracks	Postflight

#### CAUTION

Due to the high stresses to which the propeller blades are subjected, their careful maintenance is vitally important, particularly on the leading edge of each blade from the tip inboard for approximately 8 inches. All nicks and scratches must be repaired before the airplane is flown. Nicks and scratches set up concentrations of stress which can exceed the strength of the blade material; the result will be a crack and premature failure of the blade

Corrosion, cracks nicks, and dents beyond permissible limits	30 hours
Overhaul	At engine overhaul

### SECTION IV

#### MAINTENANCE AND REPAIR

In general, all instructions and procedures outlined in CAM 18 for all inspection, maintenance, and repair should be adhered to. Balancing the propeller should be performed by an FAA certificated propeller repair station since equipment necessary to accomplish the accuracy required is not normally available to line maintenance personnel.

#### A. Propeller Installation, O-320-D2B Engine

##### 1. Without Spinner

- a. Rotate the engine until the TC #1 mark on the starter gear aligns with the dot on the engine starter housing.
- b. Slide the propeller onto the engine shaft indexing it so that the blades lie approx. at the 5 o'clock and 11 o'clock positions.
- c. Install the 6 propeller retaining bolts and washers, tighten evenly, and torque to 300 inch-pounds.
- d. Secure the bolts with safety wire.

September 26, 1962

2. With Beech 169-910030 Spinner Assy.

- a. Rotate the engine until the TC #1 mark on the starter gear aligns with the dot on the engine starter housing.
- b. Slide the spinner rear bulkhead onto the engine shaft indexing it so that the tabs which have the corners cut off lie approx. at the 6 o'clock and the 12 o'clock positions.
- c. Slide the propeller onto the engine shaft indexing it so that the blades lie approx. at the 5 o'clock and 11 o'clock positions.
- d. Insert the 6 propeller retaining bolts and washers into the holes in the spinner front bulkhead, and slide the assembly onto the propeller, aligning the bulkhead cutouts with the blades. Tighten the bolts evenly and torque to 300 inch-pounds.
- e. Secure the bolts with safety wire.
- f. Slide the spinner dome onto the bulkheads, and install the 10 retaining screws and washers.

B. Propeller Removal, O-320-D2B Engine

1. Without Spinner

- a. Remove the 6 propeller retaining bolts and washers.
- b. Remove the propeller from the engine shaft.

2. With Beech 169-910030 Spinner Assy.

- a. Remove the 10 spinner dome retaining screws and washers, and remove the dome.
- b. Remove the 6 propeller retaining bolts and washers, and the spinner front bulkhead.
- c. Remove the propeller and the spinner rear bulkhead from the engine shaft.

C. Cleaning

For cleaning, use warm fresh water and soap, unleaded gasoline, or kerosene, and suitable brushes or cloths. After the blades have been cleaned, all cleaning substances must be immediately removed. Soap in any form should be removed by thoroughly rinsing with fresh water, after which all steel surfaces should be dried and coated with clean engine oil. Scrapers, power buffers, steel brushes, and any other tools or substances that will scratch or otherwise mar the surface must not be used on blades. In special cases where a high polish is desired, a good metal aircraft polish may be used, however, upon completion of the polishing, all traces of polish should be immediately removed. In no instance shall the blades be polished with a power buffer.

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Dwg. No. SERVICE MANUAL F1 PROPELLER

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F.L.T. 5/18/64

ON PAGE 6 OF SUBJECT MANUAL REVISE TABLE I AS FOLLOWS

MINIMUM REPAIRED WIDTH		MINIMUM REPAIRED THICKNESS	
IS NOW	WAS	IS NOW	WAS
5.603	5.060	1.482	1.500
5.256	5.320	1.055	1.100
5.365	5.440	.737	.790
5.153	5.270	.543	.604
4.556	4.750	.391	.443
3.323	3.790	.239	.294

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TO CORRECT ERRORS.

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  - ☒ INSPECTION
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  - ☐ ACCOUNTING
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#### D. Inspection

In addition to the methods discussed in CAM 18, another satisfactory method for detecting cracks in blades is as follows:

1. Clean the blade carefully with carbon tetrachloride and dry thoroughly, using a clean air blast if necessary.
2. Prepare a solution of 50% non-toxic, non-corrosive oil which has fluorescent quality, and 50% kerosene.
3. Completely immerse the blade in the solution and allow it to remain for a minimum of thirty minutes. After this period, remove the blade from the bath and allow the excess fluid to drain. Spray the blade with carbon tetrachloride to completely remove the remaining solution. Allow the blade to stand for fifteen minutes so that the solution will bleed out of any cracks present.
4. Carefully inspect the entire blade under a near-ultraviolet light source. The inspection must be conducted in a darkened booth or room. Solution bleeding from a surface crack will show up under the light as a bright fluorescent line.

#### E. Repairs

Major and minor repairs only within the limitations of CAM 18 are permissible. In any case, do not exceed the repair limits for width or thickness as specified in Table I.

TABLE I  
BLADE REPAIR LIMITS

Blade Station (Distance from hub center line, in.)	Minimum Repaired Width	Minimum Repaired Thickness
7 13/32	5.060 — 5.003	1.500 1.472
11 3/32	5.320 — 5.256	1.100 1.035
16 21/32	5.440 — 5.363	.790 737
22 13/64	5.270 — 5.153	.604 543
27 3/4	4.750 — 4.556	.443 391
33 19/64	3.740 — 3.328	.294 239

The only acceptable methods of repairing cuts, nicks, cracks, etc., are those by which the damaged portion is removed to leave a smooth well-faired surface. Methods which attempt to relocate metal by cold-working to cover or conceal the defect rather than remove the damage are not permissible.

September 26, 1962

#### F. Checking Propeller Track in the Shop

1. Mount it on a protractor bench mandrel.
2. Place a stationary object at the tip of one of the blades and make a mark on the object where the center of the blade touches it.
3. Rotate the propeller 180 degrees and repeat the above operation with this blade.
4. Measure the distance between the centerlines of the two marks. The allowable difference is 1/8 inch.
5. If the distance is greater than 1/8 inch, the propeller should be sent to an FAA certificated propeller repair station for further inspection and repair.

#### G. Checking Propeller Track on the Aircraft

The following procedure should not be attempted unless it is known that the engine shaft is not out of line. The airplane must be in a hangar where air currents will not rock it. Use the following procedure:

1. Place a stationary object at the tip of one of the blades and make a mark on the object where the center of the blade touches it.
2. Rotate the propeller 180 degrees and repeat the above operation with this blade.
3. Measure the distance between the centerlines of the two marks. The allowable difference is 1/8 inch.
4. If the distance is greater than 1/8 inch, the propeller should be sent to an FAA certificated propeller repair station for further inspection and repair.

#### H. Painting

Carefully touch up minor paint damage due to repair operation or wear. Propellers requiring complete repainting shall first be stripped of their remaining paint and then painted according to the following instructions:

1. All surfaces to be painted shall be thoroughly cleaned immediately before the application of the primary coat. Use benzol, carbon tetrachloride or some other suitable organic solvent. Use same care when applying second topcoat, that preceding topcoat has not become soiled.
2. The flat face of the blade will receive a three-coat application; one primary coat and two topcoats. Mask-off the camber face of the blade, using any suitable method.

3. The primer shall be zinc chromate thinned with toluol. Apply it evenly over the surface of blade avoiding a heavy coat. Allow to dry for at least 30 minutes at room temperature in a dust free atmosphere.

#### I. Balancing

Following any appreciable blade repair, the propeller must be balanced. The suspension type balancer is recommended because of the direct indication of the direction in which the propeller is out of balance, no delicately adjusted balance ways are necessary, and because of its ease of interpretation.

Small amounts of unbalance can be corrected by spraying an additional light coat of black paint on the flat face of the light blade. Do not use heavy applications of paint for this purpose, since unbalance will re-occur as soon as the paint erodes away.

Appreciable unbalance can be corrected only by removing material. This can best be accomplished by abrasive grinding and polishing, and should be done only on the camber side of each blade and on the sides of the hub. Metal removed must be held within the limits in Table I. Sideways unbalance can often be best corrected by removal of metal on the camber side close to the leading edge of one blade and to the trailing edge of the other blade on the heavy side.

It is important not to leave any abrasive scratches across the blade. Always finish the polishing operation so that any abrasive marks that may remain run along the blades, not across them. In any case, remove all deep scratches.

For those who have conventional balancing arbors, adapter cones, and parallel knife edges, the procedure is identical to the preceding instructions. However, instead of unbalance being indicated by a disc indicator, it is indicated by a tendency of the propeller to rotate toward the heavy side. It should be noted that the knife edges, arbors, and adapters must be free from all foreign matter, and must be smooth and true. The ways should be checked for parallelism prior to balancing the propeller.

# SECTION V

## PARTS LIST

Item No.	Part No.	Nomenclature	No. Req.
1	FLC7660-2	Propeller	1
2	** 169-910030-5	Rear Spinner Bulkhead	1
3	** 169-910030-3	Front Spinner Bulkhead	1
4	** 169-910030-1	Spinner Dome	1
5	@ 336	Bolt	6
6	AN960-616	Washer	6
7	# AN525-10R8	Screw	10
8	# AN960-10	Washer	10
-	MS20995C41	Safety Wire	as req.

\* Beech Aircraft Corp. Part No.

@ Flottorp Mfg. Co. Part No.

# Optional Equipment

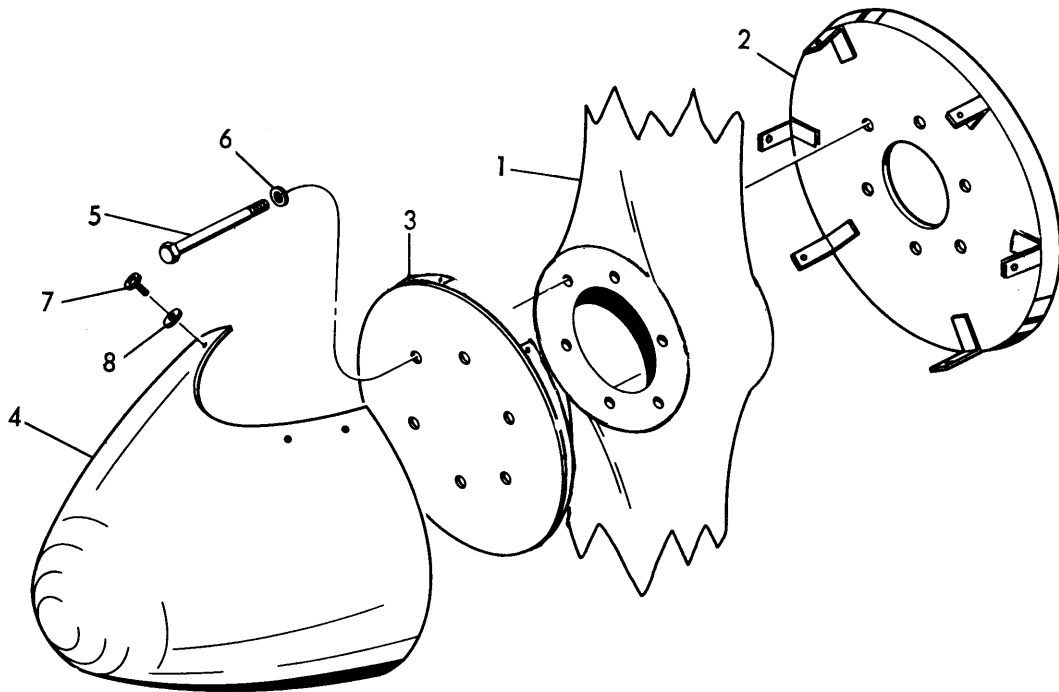


Figure 1

Propeller Assembly

September 26, 1962

TABLE OF PITCH ANGLES FOR THE F1C7660-2 PROPELLER

PITCH XX	RADIUS STATION						
	7.40	11.10	16.65	22.20	27.75	33.30	37.00
58	37°30'	33°30'	27°30'	22°30'	18°24'	15°24'	13°51'
59	37°30'	33°30'	27°48'	22°48'	18°42'	15°42'	14°9'
60	37°30'	33°30'	28°6'	23°6'	19°0'	16°0'	14°27'
61	37°30'	33°30'	28°24'	23°24'	19°18'	16°18'	14°45'
62	37°30'	33°30'	28°42'	23°42'	19°36'	16°36'	15°3'

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3.323	3.740

MINIMUM REPAIRED THICKNESS	
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1.482	1.500
1.055	1.100
737	790
543	604
391	443
239	294

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TABLE OF PITCH ANGLES FOR THE F1C7660-2 PROPELLER

PITCH XX	7.40	RADIUS STATION					33.30	37.00
		11.10	16.65	22.20	27.75	33.30		
58	37°30'	33°30'	27°30' 27.5	22°30' 22.5	18°24' 18.4	15°24' 15.4	13°51'	
59	37°30'	33°30'	27°48' 27.8	22°48' 22.8	18°42' 18.7	15°42' 15.7	14°09'	
60	37°30'	33°30'	28°06' 28.1	23°06' 23.1	19°01' 19.0	16°01' 16.0	14°27'	
61	37°30'	33°30'	28°24' 28.4	23°24' 23.4	19°18' 19.3	16°18' 16.3	14°45'	
62	37°30'	33°30'	28°42' 28.7	23°42' 23.7	19°36' 19.6	16°36' 16.6	15°03'	

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