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M-42 WAVEMAKER OPERATION

by

R.W. Higham

DOCUMENTATION PAGE

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INTRODUCTION

The facility known as M-42 at NRC's Montreal Rd. Laboratory in Ottawa consists of a seakeeping basin 122 metres long by 61 metres wide and about 3 metres deep. At one end is a wave absorbing beach and at the other end a wave generator, and a building known as the "tent" containing the machinery for making the waves.

On one side of the basin is a building which contains a dock where the model can be moved from the basin without removal from the water. This dock provides a convenient area for working on the model, and there is a crane overhead for lifting it out when required.

Next to this building is a 10 metre high tower from where the operator can drive radio controlled models with a clear view over the basin.

The purpose of this report is to describe the method of starting the wavemaker, and adjusting the wave amplitude and frequency.

SYSTEM DESCRIPTION

The wavemaker at M-42 is made up of eight wavemaking generators. Each generator has a 100hp electric motor which drives a large fan. The output from this fan is channelled through ducts via reciprocating flaps, "C and D" to the wave hood (Figure 1).

The position of the flaps determines whether the wave hood is subjected to a positive or negative pressure.

There are other flaps, "A and B" which can be adjusted to recirculate some of the air to the input side of the fan. This has the effect of reducing the pressure at the wave hood, and consequently reducing the size of the wave created by the generator.

CONTROLS

There are controls for the wavemaker at three locations. Inside the "tent" is an electrical room where the primary

controls are located (Figure 2). The primary controls are: eight main power switches, a manual adjustable speed control and an auto sequencer for the fan motors.

FANS

Inside the "cage" at the M-42 building is another set of controls, (Figure 3). There is a button for starting the fans, a button for starting the flaps for frequency control, and eight switches to open or close the flaps which control the wave height.

Above each of these switches is an analogue meter which indicates the degree to which each flap is open. There is a Bendix connector above meter number five into which the potentiometer for adjusting wave frequency can be plugged.

In the tower are another set of controls (Figure 4). These permit the fans to be started, the wavemakers (i.e. reciprocating flaps) to be started, and the wave frequency adjusted using the potentiometer. The wave height cannot be adjusted from the tower; this can only be done from the cage, preferably by someone already down below.

START-UP SEQUENCE

In order for the fans to be started the West door of the tent should be opened to its uppermost position since it incorporates an interlock switch. This is required for cooling purposes. It is recommended that the East door is also open to give flow through ventilation.

The square plywood covers on the intake and exhaust stacks of each wave generator should also be removed.

The main power switches in the electrical room inside the tent should be checked, they should be in the "ON" position, and the switch in the upper right hand corner in the "AUTO" position.

Plant engineering is usually responsible for the above steps at the beginning of the testing season, but it is recommended that a check be made before starting the wavemaker.

The next steps are carried out using the controls in the cage (Figure 3). The button marked "FANS" is pushed and the

fans will start up sequentially, this is to prevent overloading the electrical circuits. When all the fans are running the "fan 8 on" lamp will be illuminated.

WAVE HEIGHT

The wave height is determined by the position of flaps A and B (Figure 1). The angle can be adjusted by turning the switch under the analogue meters to "OPEN" or "CLOSE" (Figure 3). The switch must be held until the desired angle is obtained on the meter. Opening the flaps increases the wave height.

Obtaining a specific wave height is a matter of trial and error; setting all analogue meters to the same angle will not necessarily give the same wave height from each generator. Creating an even wave across the tank can be a time consuming and frustrating undertaking.

The flap angles can be set to some arbitrary number initially and the wave observed for size.

WAVEMAKER

In order to start creating waves the button marked "flaps" should be pushed (Figure 3): this button is marked "wavemaker" on the tower control panel. Flaps "C" and "D" will now be reciprocating (Figure 1), driven by a long drive shaft connecting all wave generators. The speed at which these flaps move determines the wave frequency.

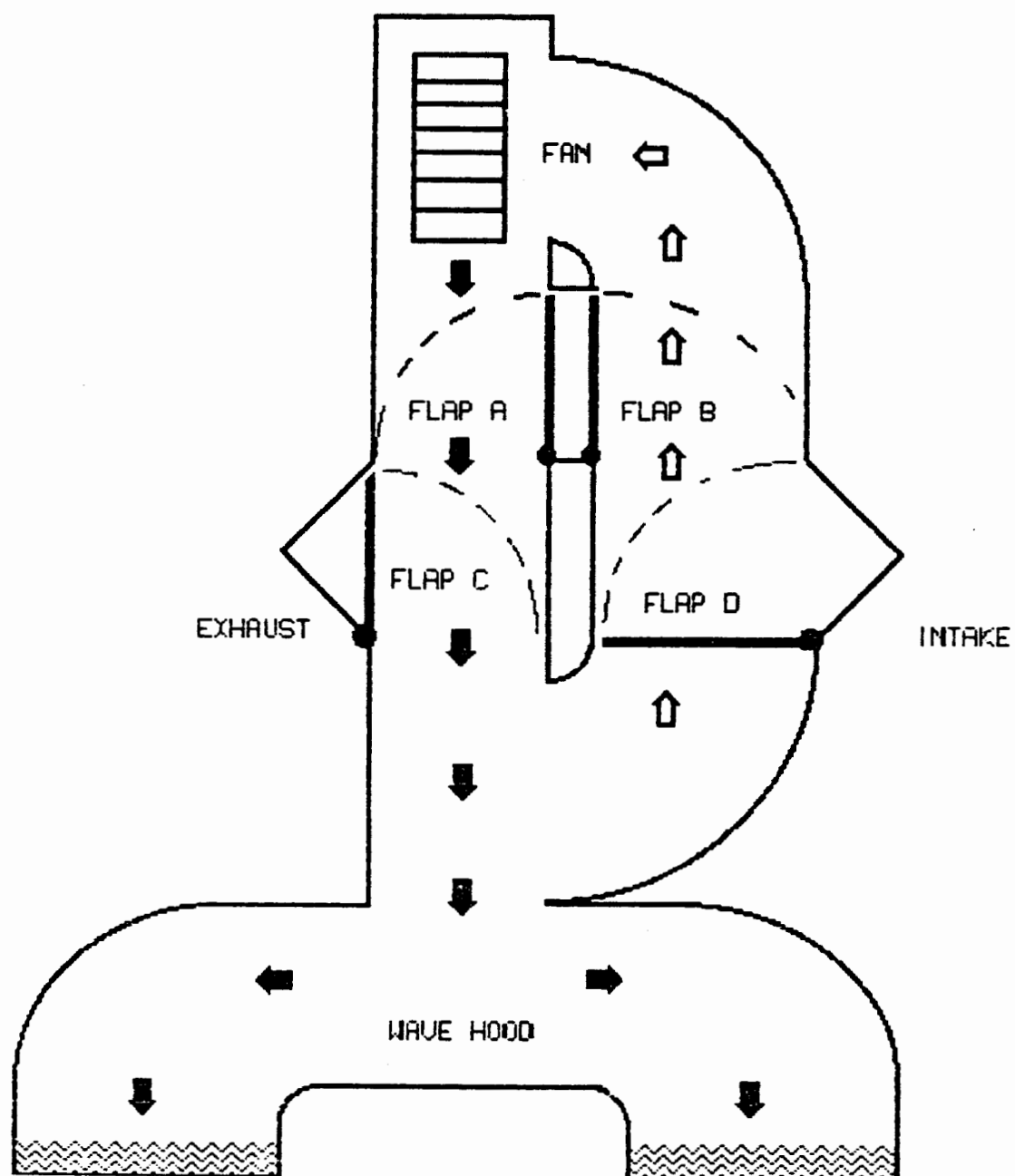
FREQUENCY

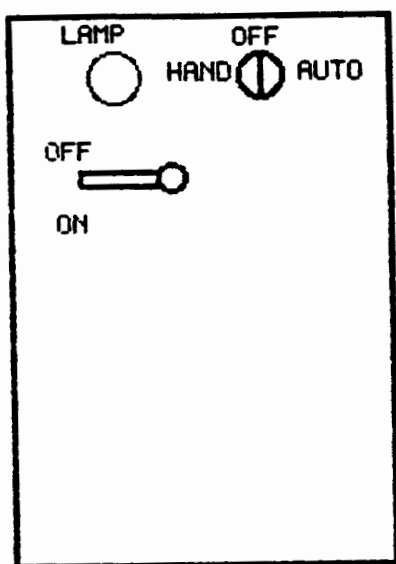
The frequency is set using the potentiometer (Figure 4), which can be plugged into the tower panel or the Bendix connector in the cage. It is determined by observing the number of waves passing a given point and timing them with a stopwatch. This can be calibrated for a given waveheight but will change if a new waveheight is set.

SHUTDOWN

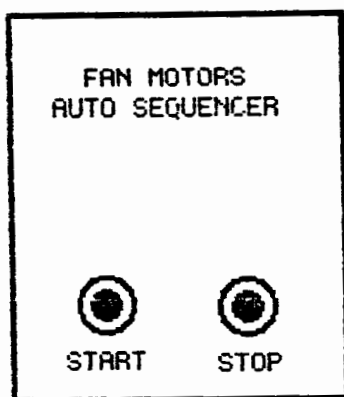
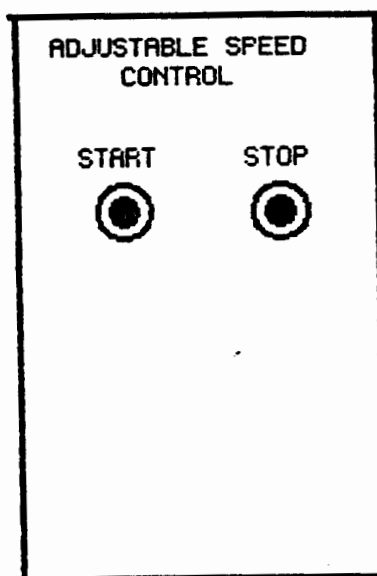
To shut the system down, the wavemakers are stopped, then the fans turned off and the doors to the tent closed.

M 42 WAVEMAKER



CONTROLS IN TENT

MAIN POWER TO FANS
8 SWITCHES



CAGE WAVEMAKER CONTROLS

LM-HYD-66

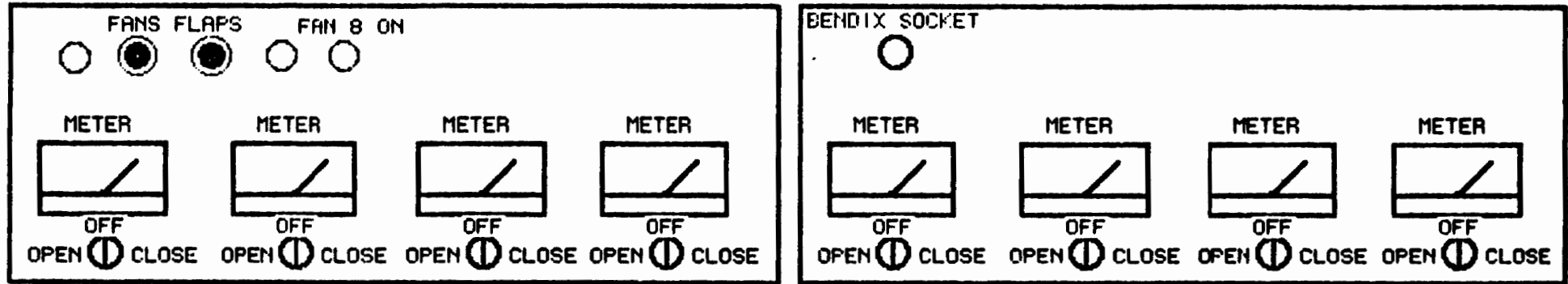


Figure 3

WAVEMAKER CONTROLS M 42 TOWER

