Session 4
Paper (d)

PLANNING PRINCIPLES FOR F.M.C. SKIDDERS

S.P. Vari
Planning Superintendent
Kaingaroa Logging Co.
MURUPARA.

INTRODUCTION

As Planners in an increasingly sensitive and high-cost industry it is, I suggest, our duty to evaluate those options which this seminar have highlighted; - not only during these three days, but as a continuous process in carrying out our jobs.

Let me remind you of these options, and there is no better way to do this than to quote Viv Donovans definition of tactical Planning:

> "What is tactical Planning?
> Given an existing forest the ways and means of logging it so that production, safety and environmental protection are compatible at least cost and that logging practices do not degrade other land values.
> Two options exist:
> Choice of the best system and equipment for the new situation;
> Planning to make best use of current equipment where limited options exist".

Planners should be addressing themselves to these options constantly. The process or techniques used will vary according to particular situations, and the degree of flexibility they present.

Planning, like economics, is concerned with the best use of scarce resources, - These could be finance, equipment, Labour or in some cases good Planners.

THE F.M.C. 2200 C.A. LOG SKIDDER

The F.M.C. Skidder is a special breed of logging equipment which the Planner can use when options are limited.

Before discussing some of the Planning sequence used, it may be just as well to say something about the machine itself.

F.M.C. skidders were developed from the military vehicle originally designed as a personnel carrier. Some of the design features such as speed, light weight and smooth-riding suspension were useful in converting the carrier to a logging machine.

The present 220 series is a third generation model incorporating improvements over the earlier 200 and 210 series. Low ground pressure, about 39kPa (5.6ps.i) is an important feature when planning for environmentally sensitive areas. It has a maximum speed of 24 km/h (15 mph) and the smooth ride is attributed to its flexible "soft" track. The track is composed of forged steel pads or segments joined by pins with rubber bushings.

This track is supported by a front drive sprocket, a rear idler, and five road wheels on each side. The road wheels are suspended independently by torsion bars. This arrangement allows the track to conform to the contours of the ground, rolling over obstacles like a snake, instead of having to climb over them and lose ground contact over portions of the track.

The result is a comparatively smooth ride and minimal ground disturbance.

The drive train includes a 149 kw (200 hp) G.M. 6V 53N diesel engine supplying power to a front-mounted differential via a torque converter and 4-speed power shift transmission. The differential delivers power separately to each track via planetary final drives, and steering is controlled by steering brakes within the differential. This ability to keep power in both tracks during a turn is especially useful when climbing or under heavy load.

Basic specifications of the F.M.C. 220 CA

Engine - G.M. 6V53N Detroit diesel
Transmission - Clark - powershift 4 speed forward and reverse
Horsepower - (200) 149 kw.
Suspension - Roadwheels, torsion bar sprung
Unladen operating weight - 12.7 tonnes
Area of track on ground - 3.208 sq.metres
Overall height - 3.15m
Overall width - 2.62m
Ground clearance - 48.3 cm
Winch capacity - 65.8m of 19mm dia. rope
Max line pull - 18148 kg (bare drum)
Max line speed - 103.6 m/sec (full drum)

KEY POINTS ABOUT THE F.M.C.

The previous brief description shows that the F.M.C. possesses certain specialcharacteristics which are important for a Planner to be aware of when weighing out the options open to him.

These are:-

'Soft' tracks, low ground pressure
- allows mobility in soft ground and minimize disturbance in environmentally sensitive areas.

Fast travel speeds
- enables longer average hauls

Weight: Power Ratio
- Its low weight gives a better weight to Power ratio resulting in a comparatively higher pulling capacity.
Note: In horsepower it is equivalent to a D7, but is 8 tonnes lighter.

Controlled differential steering
- Having power applied in the tracks for steering enables the machine to overcome adverse slopes and improves its turning ability.

Flexibility
- It fits into existing logging systems with no special requirements for falling or loading

Disadvantages
- The F.M.C. has three major disadvantages.
It is a high cost machine
It is a high maintenance machine
It is highly susceptible to self-destruct
- by this, I mean, that its speed, power and traction combined with its light construction makes it extremely operator sensitive.

Now you know some of the key advantages and disadvantages of the F.M.C.
- lets talk about specifics.

TACTICAL PLANNING AS APPLIED AT K.L.C.

a) General Procedure

Plans are usually done on a compartment basis. A compartment is taken from the annual program issued by the Forest Service, and a logging strategy based on that compartments feature, e.g. terrain, ground conditions, piece size etc., is derived.

From a preliminary survey of the compartment's features, applicable logging systems are chosen by planning staff. The initial survey usually involves, an assessment of tree and log parameters by a field crew, and measurement of other field data such as slopes, undergrowth, and other features capable of affecting operations in the compartment. Aerial photographs and maps, featuring topography and timber boundaries, are added to the survey information, so that a comprehensive picture of the compartment is built up.

Planning staff then locate potential road and landing configurations on 1:5000 scale maps, using accumulated compartment information. Landings are laid out as symetrically as practical, with the necessary roading paths to facilitate trucking access, linking them. The symetrical landing layout is desirable because, for a given setting area, the more regular the shape, and more central the landing, the shorter the average hauling distance.

For each of the potential road and skid configurations the least cost, practical hauling systems combination is calculated. From this a total hauling cost for each road and skid configuration is determined. Then the roads and skids are costed so that each configuration has a total logging cost.

The cheapest total cost, and appropriate combination of roads, skids and hauling systems, is then chosen to log the compartment.

b) Selecting the optimum combination

The general equation for determining the cost of combinations of roads, skids and hauling systems is:-

HC + SC + RC = TLC

where:- HC is hauling cost, dependant on the combination of hauling systems, piece size, hauling conditions and haul distance

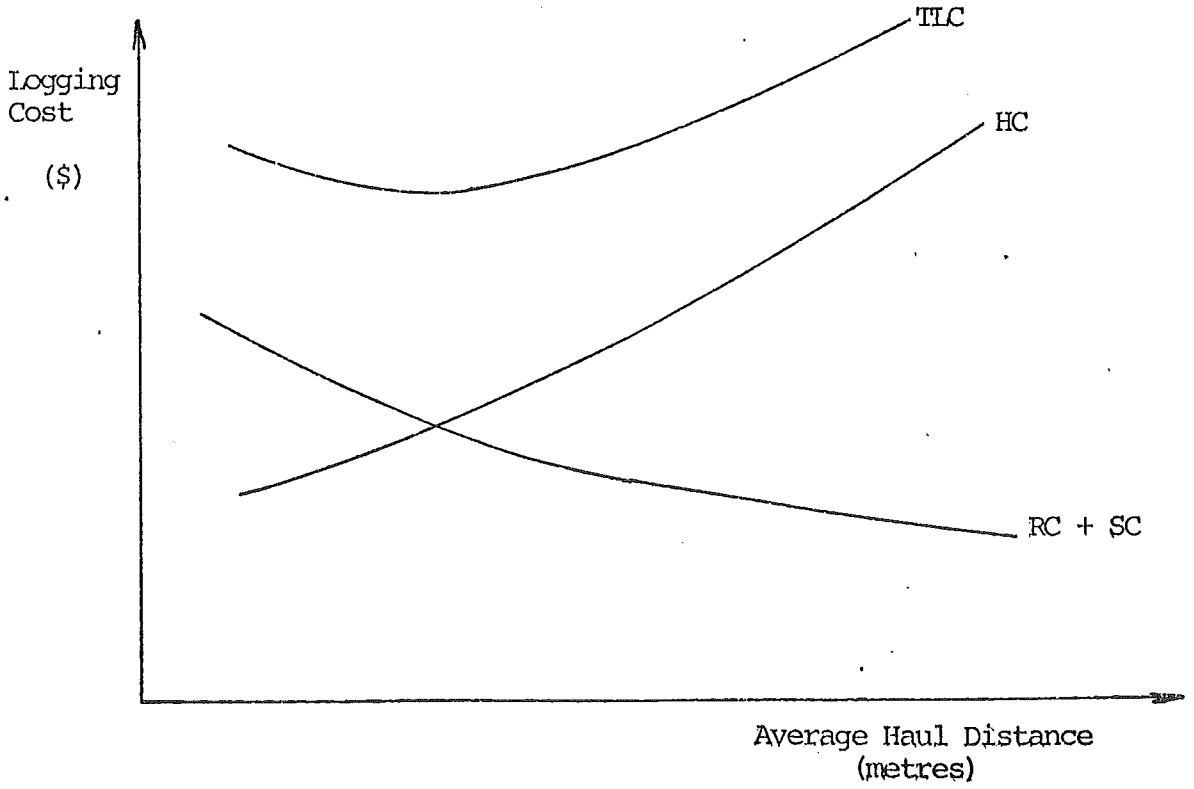
SC is landing cost, dependant on the type and number

RC is roading construction cost, dependant on the adversity and length of roading

and:- TLC is total logging cost.

The optimum combination for a compartment is the minimum TLC. Generally, the effect of increasing the cost of road and skids is to reduce the average haul distance and subsequently decrease the hauling cost. Thus the minimum TLC will usually occur when the marginal cost of additional roading and skids is equivalent to the marginal saving in hauling cost, produced by the reduced haul distance. This can be illustrated graphically.

Figure 1. Logging Cost on Average Haul Distance



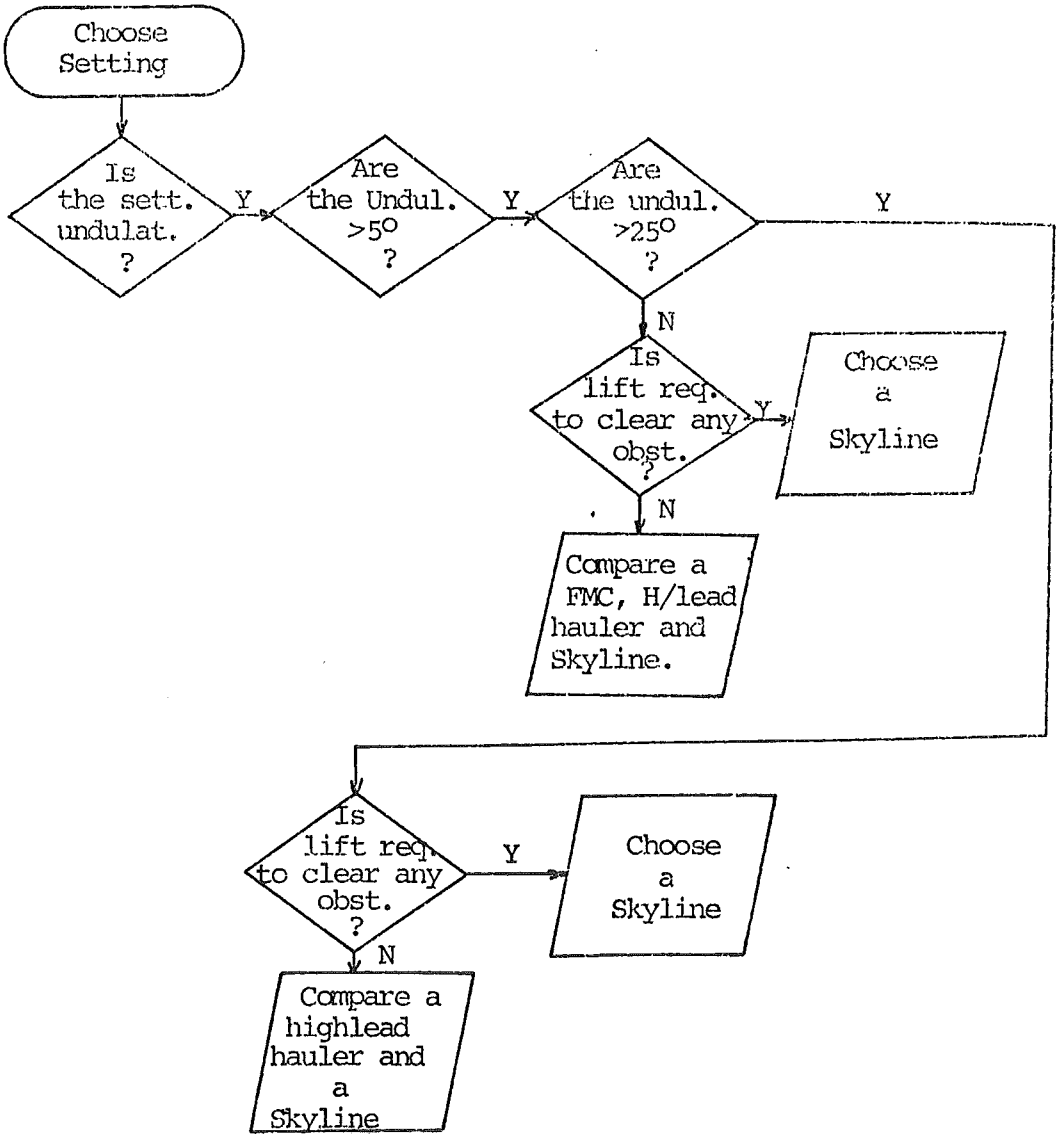
c) Evaluating the Cost of roads and Landings

Roads and skid location is obviously constrained by a compartment's physical features. Consistant with maximum allowable road grades and a desire to minimise grades, a number of potential road and skid configurations are planned. The cost of each configuration is usually based on cost information from recently logged compartments with similar operating conditions. These costs are simply pro-rata on the length of road and number of skids. If the roading is complicated by adverse grades, cuts or haul material, costs are estimated from the expected machine time necessary to complete specific pieces of road. Thus, road and landing costs for each configuration are derived.

d) Choosing applicable hauling systems

For each configuration of roads and skids a compartment can be broken into a series of similar hauling settings. These settings are mainly separated by topography and any adversity. The applicable hauling systems (hauling machines) are initially broadly selected by a process of elimination. The flowchart set out below is indicative of how potential hauling machines are chosen.

FLOWCHART FOR SELECTING HAULING MACHINES



Once the options are known, the next step is to evaluate them based on historical Work Study and cost information . The analysis can be a very tedious affair unless you happen to own a computer or have access to one.

SPECIFIC PLANNING REQUIREMENTS FOR THE F.M.C.

In planning for the F.M.C. you can afford to be a little more innovative.

K.L.C.'s experience has shown that in typical tractor or skidder country the limiting factors are the capability of the skiddy's and loader to handle production that F.M.C. will haul.

PLANNING SEQUENCE:

(1) Establish the economic unit cost for the wood.

(2) Using Work Study standards, derive the average haul distance and manning level to give the required production rate.

(3) Check that topography and other limiting features of the stand allows for that haul distance and production rate to be achieved.

(4) Vary the options to give the best unit cost.

As mentioned above in typical tractor/skidder country the F.M.C. will haul up to 700m^3 per 7½ shift in a stand of old crop P. Radiata 3.5 m^3 average stem volume.

The unit cost though cheaper by up to 15% than a skidder or tractor, the F.M.C. is best used in marginal or critical sites if it is shown that the unit cost difference is better than this or where there simply is no other choice.

Key Specific points - F.M.C. Planning for marginal sites

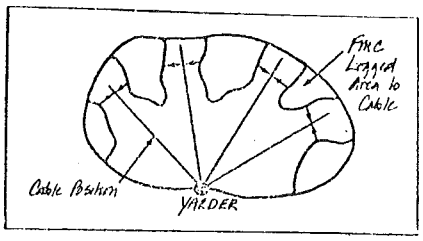
(1) Pre-track if allowed
(2) Fell to suit butt hauling
(3) Keep the drag sizes to a level to avoid winching .
(4) Track to minimise side pulling.

TYPICAL MARGINAL SITES USE

(1) With Cable Systems

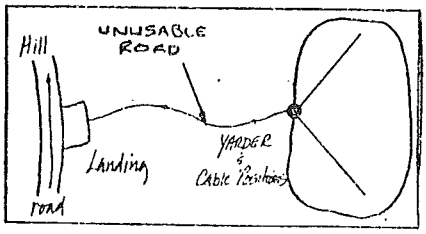
(a) Cleaning corners

Haul long or blind corners



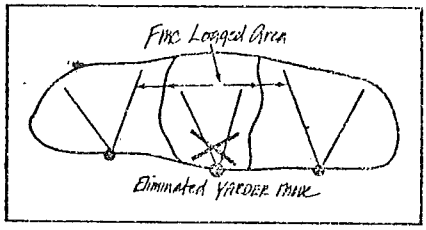
(b) Haul as Forwarder

Haul from yarder to a landing where tracks or other forms of transport can reach.

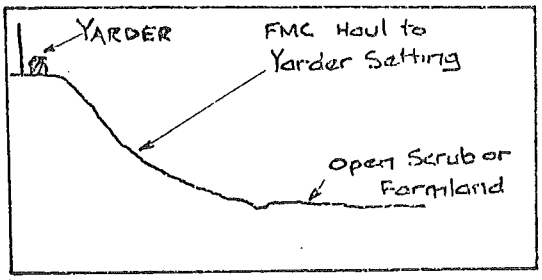


(c) Reduce Yarder setting

May be economical to use and cut costs in cable re-setting.



(d) Assist where suitable Anchors are not available



(2) With Skidders or Crawler

Scout haul out of sensitive areas or do long hauls of pre-bunched logs.

(3) Use with helicopters

(4) Haul out of Wet, Swampy ground

(5) Use in areas where debris and other ground obstacles are a problem.

(6) Use on Farm/Forestry woodlots.

FUTURE APPLICATIONS

As the demand and competition for land between farming and forestry get more acute in the next decade or so, I have no doubt that F.M.C.'s or machines of a similar nature will become increasing popular.

It is obvious that except for farm woodlots, our best use land policy will only allow extensive forestry on marginal land, that farming does not want.

I can see that in places like Mangatu, Hikurangi and the other potential forest areas in the Poverty Bay - East Cape area, F.M.C. type equipment will be the most like choice for logging except for the very steep country.

My guess then, is that in the year 2000, High speed track skidders with even lower ground pressures than 39 kPa will be as common as Watties pea harvestors in the Gisborne District.