ANNEX A

(to Recommendation E.506)

COMPOSITE STRATEGY

A.1 *Introduction*

This annex describes a method for estimating international traffic based on monthly paid—minutes and a number of conversion factors. It demonstrates the method by examining the factors and showing their utility.

The method is seen to have two main features:

1) Monthly paid—minutes exchanged continuously between Administrations for accounting purposes provide a large and continuous volume of data.

2) Traffic conversion factors are relatively stable, when compared with traffic growth and change slowly since they are governed by customers' habits and network performance. By separately considering the paid minutes and the traffic conversion factors, we gain an insight into the nature of traffic growth which cannot be obtained by circuit occupancy measurements alone. Because of the stability of the conversion factors, these may be measured using relatively small samples, thus contributing to the economy of the procedure.

A.2 *Basic procedure*

A.2.1 *General*

The composite strategy is carried out for each stream, for each direction and generally for each service category.

The estimated mean offered busy—hour traffic (in Erlangs) is derived from the monthly paid—minutes using the formula:

$$A = Mdh/60e \qquad \text{(A—1)}$$

where

A is the estimated mean traffic in Erlangs offered in the busy hour,

M is the total monthly paid—minutes,

d is the day/month ratio, i.e. the ratio of average weekday paid—time to monthly paid—time,

h is the busy—hour/day ratio, i.e. the ratio of the busy—hour paid—time to the average daily paid—time,

e is the efficiency factor, i.e. the ratio of busy—hour paid—time to busy—hour occupied—time.

A.2.2 *Monthly paid—minutes (M)*[2)]

The starting point for the composite strategy is paid minutes. Sudden changes in subscriber demand, for example, resulting from improvements in transmission quality, have a time constant of the order of several months, and on this basis paid minutes accumulated over monthly intervals appear to be optimum in terms of monitoring traffic growth. A longer period (e.g. annually) tends to mask significant changes, whereas a shorter period (e.g. daily) not only increases the amount of data, but also increases the magnitude of fluctuations from one period to the next. A further advantage of the one—month period is that monthly paid—minute figures are exchanged between Administrations for accounting purposes and consequently historical records covering many years are normally readily available.

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2) In a situation where only yearly paid—minutes are available, this may be converted to M by a suitable factor.

It should be recognized, however, that accounting information exchanges between Administrations often take place after the event, and it may take some time to reach full adjustments (e.g. collect call traffic).

A.2.3 *Day/month ratio (d)*

This ratio is related to the amount of traffic carried on a typical weekday compared with the total amount of traffic carried in a month.

As the number of weekdays and non—weekdays (weekends and holidays) varies month by month, it is not convenient to refer to a typical month, but it should be possible to compute the ratio for the month for which the busy hour traffic is relevant.

Hence if:

X denotes the number of weekdays in the related month

Y denotes the number of non—weekdays (weekend days and holidays) in the selected month, then

$$\frac{1}{d} = X + Y \,.\, r \qquad \text{(A—2)}$$

where

$$r = \frac{\text{Average non—weekday traffic}}{\text{Average weekday traffic}}$$

The relative amount of non—weekday traffic is very sensitive to the relative amount of social contact between origin and destination. (Social calls, are, in general, made more frequently on weekends.) Since changes in such social contact would be very slow, r or d are expected to be the most stable conversion factors, which in general vary only within relatively narrow limits. However, tariff policies such as reduced weekend rates can have a significant effect on r and d.

When r is in the region of 1, the Sunday traffic may exceed the typical weekday level. If this is the case, consideration should be given to dimensioning the route to cater for the additional weekend (Sunday) traffic or adopting a suitable overflow routing arrangement.

A.2.4 *Busy—hour/day ratio (h)*

The relative amount of average weekday traffic in the busy hour primarily depends on the difference between the local time at origin and destination. Moderately successful attempts have been made to predict the diurnal distribution of traffic based on this information together with supposed “degree of convenience” at origin and destination. However, sufficient discrepancies exist to warrant measuring the diurnal distribution, from which the busy—hour/day ratio may be calculated.

Where measurement data is not available, a good starting point is Recommendation E.523. From the theoretical distributions found in Recommendation E.523, one finds variations in the busy—hour/day ratio from 10% for 0 to 2 hours time difference and up to 13.5% for 7 hours time difference.

As described above, the composite strategy is implemented as an accounting—based procedure. However, it may be more practical for some Administrations to measure d and h based on occupied time, derived from available call recording equipment.

A.2.5 *Efficiency factor (e)*

The efficiency factor (ratio of busy—hour paid time to busy—hour occupied time, e) converts the paid time into a measure of total circuit occupancy. It is therefore necessary to include all occupied circuit time in the measurement of this ratio, and not merely circuit time taken up in establishing paid calls. For example, the measurement of total circuit occupied time should include the occupied time for paid calls (time from circuit seizure to circuit clearance) and, in addition, the occupied time for directory inquiry calls, test calls, service calls, ineffective attempts and other classes of unpaid traffic handled during the busy hour.

There is a tendency for the efficiency to change with time. In this regard, efficiency is mainly a function of operating method (manual, semi—automatic, international subscriber dialling), the B—subscriber's availability, and the quality of the distant network.

Forecasts of the efficiency can be made on the basis of extrapolation of past trends together with adjustments for planned improvements.

The detailed consideration of efficiency is also an advantage from an operational viewpoint in that it may be possible to identify improvements that may be made, and quantify the benefits deriving from such improvements.

It should be noted that the practical limit for e is generally about 0.8 to 0.9 for automatic working.

A.2.6 *Mean offered busy hour traffic (A)*

It should be noted that A is the mean offered busy—hour traffic expressed in Erlangs.

A.2.7 *Use of composite strategy*

In the case of countries with lower traffic volumes and manual operation, the paid—time factors (d and h) would be available from analysis of call vouchers (dockets). For derivation of the efficiency e, the manual operator would have to log the busy—hour occupied time as well as the paid time during the sampling period.

In countries using stored—program controlled exchanges with associated manual assistance positions, computer analysis may aid the composite forecasting procedure.

One consequence of the procedure is that the factors d and h give a picture of subscriber behaviour, in that unpaid time (inquiry calls, test calls, service calls, etc.) are not included in the measurement of these factors. The importance of deriving the efficiency, e, during the busy hour, should also be emphasized.