Given a model defining one or more equations in one or more variables, the integral(s) can be estimated over a hyper-rectangular region defined by fixed limits.

The following procedure is required for just one function of $m \geq 1$ variables, although $n \geq 1$ functions of $m \geq 1$ variables can be analyzed in exactly the same way.

1. Create a file defining the function of m variables to be integrated.
2. Open program **usermod** and input the file defining one function of m variables.
3. It is necessary to explicitly indicate that one function is required and m must be input correctly.
4. Program **usermod** then checks that the function is defined correctly.
5. The range of integration required must be defined by editing the vectors $BLIM$ and $TLIM$ to specify the m lower and upper limits for the corresponding variables.
6. The absolute error $EPSABS$ and relative error $EPSREL$ parameters required must be set.
7. Integration can then be requested but the result should only accepted if $IFAIL = 0$ on completion.
8. If $|IFAIL| > 0$ some of the previous parameters will have to be adjusted.

From the main SIMFIT menu, choose [A/Z], open program **usermod**, then read in the test file `d01fcf.mod` which defines the the integrand used to evaluate the following integral

$$I = \int_0^1 \int_0^1 \int_0^1 \int_0^1 \frac{4u_1u_3^2 \exp(2u_1u_3)}{(1+u_2+u_4)^2}\, du_4\, du_3\, du_2\, du_1$$

and the results are listed in the next table.

$IFAIL$	0 (from $D01EAF$)
$EPSABS$	1.000E-06
$EPSREL$	1.000E-03

Number	$BLIM$	$TLIM$
1	0.0	1.0
2	0.0	1.0
3	0.0	1.0
4	0.0	1.0

Number	$INTEGRAL$	$ABSEST$
1	0.57533267	1.0782E-04

Note that in order to perform the integration it may be necessary to re-define the limits, absolute, and relative tolerances, which can be done interactively.

Exit with IFAIL = 0 indicates that the absolute error estimate $ABSEST$ satisfies

$$|ABSEST| \leq \max(EPSABS, ABSREL \times |INTEGRAL|)$$

as defined for NAG routine D01EAF.

The model equation file `d01fcf_e.mod` is as follows.

```
%
f(y) = {4y(1)y(3)^2[exp(2y(1)y(3))]}/{1 + y(2) + y(4)}^2
%
1 equation
4 variables
0 parameters
%
begin{expression}
f(1) = 4y(1)y(3)^2[exp(2y(1)y(3))]/[1.0 + y(2) + y(4)]^2
end{expression}
%
```